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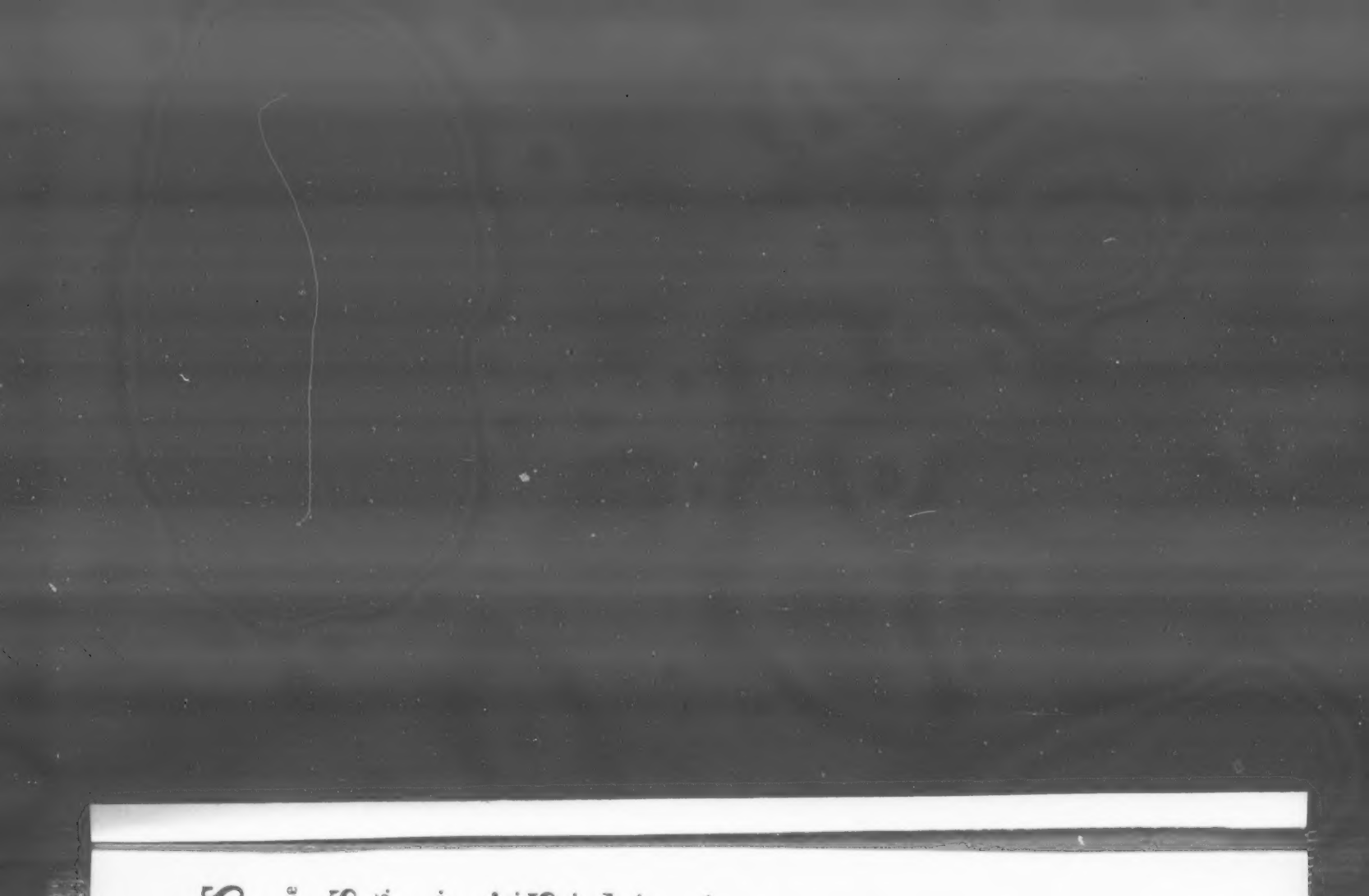

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THE

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OCTOBER, 1913

ORIGINAL ARTICLES

THE INFLUENCE OF SKELETAL DEFECTS, CONGENITAL AND ACQUIRED, UPON THE BODY IN HEALTH AND DISEASE.

By Charles F. Painter, M.D.,

PROFESSOR OF ORTHOPEDIC SURGERY IN TUFTS COLLEGE MEDICAL SCHOOL, BOSTON, MASSACHUSETTS.

Among the many good results attained in the period of specialization through which we are passing has been the focusing of attention upon certain of the fundamental branches of knowledge necessary for a physician to possess. Little by little it has been found that many of the old theories in regard to disease were erroneous in whole or in part, and research has supplied in some instances at least a correct theory upon which to work. Much has still to be learned. Not all the problems are as yet solved. Scarcely a month goes by without some promising clue being discovered, and though most of them do not lead to the desired result, still the following of them up is bringing us a little nearer the truth. It seems strange sometimes that anatomy should be the branch of medicine to which we may still look for suggestions in the solution of our problems. It has been the groundwork of a physician's knowledge so long that it would appear at first thought it could have no secrets that had not already been revealed. Viewed from the standpoint of descriptive anatomy alone it is probable that there is not much to be added to what has been observed from the time of Vesalius to our present-day authorities. There is, however, another side to anatomy, and that is the comparative. The human being, as we study him, is looked at as the product of an evolutionary process operating through an immeasurably long period, and it may well be that we are still in a transitional stage. Environment and its necessities have imposed upon the

evoluting creature, whatever it may have been, its impress. Adaptation to its surroundings has been a characteristic of a developing organism, whether we look upon the life history of an individual or of the race to which he belongs. Some of the functional adaptations are trivial, and others are more or less fundamental. Looked at from this standpoint it would seem that anatomy might still have many a lesson for us which should be valuable in preparing the way for a better understanding of some of our unsolved problems. In what is to follow, therefore, there will be presented to a considerable extent some of the attempts to profit by knowledge acquired from anatomic sources.

We are disposed to assume that the body is so endowed with energy and is so infinitely adaptable to changing conditions that its functions may be continued in a normal manner to permit of healthful existence and the output of a volume of energy proportioned to the capacity of the machine. It is true that in the human mechanism there is a wider latitude than there is in any other known mechanism for loss of force and for the performance of function under conditions which are, to say the least, adverse. What we do not realize, and have taken few steps to understand, is (1) to what extent anatomic defect influences the proper functional uses of the body; (2) to what degree and in what way these anatomic peculiarities may influence physiologic function; (3) to what kind of abnormal anatomic changes these perversions of function may give rise.

The history of the practice of medicine is replete with examples of the way the profession has tried to solve situations where anatomic disarrangements seemed to be the cause for a train of symptoms physically distressing to the patient. One need only mention the fact that a considerable part of gynecologic treatment has had such a supposition as its basis, and the fact that floating kidneys and other visceroptoses have been treated mechanically by the surgeon with this hypothesis in mind. Pain or some form of physical discomfort is the factor that leads a patient to seek advice from his physician in the majority of cases, and in the procurement of a total or partial relief of this both patient and physician lose sight of the underlying cause of this symptom and of effects which are oftentimes of more real significance than the pain itself. A more thorough knowledge and appreciation of the interdependence of physiologic function upon anatomic adaptation to environment and function is what is needed on the part of everyone who seeks to aid in the solution of medical problems in these days.

The results of the researches of laboratory investigators in the past twenty to thirty years have brought us to a position where a large part of the diseases which we are called upon to treat have been shown to be the result of infections. In those cases in which it has been possible to isolate and specifically identify the cause

of an infection we are content for the present at least to assume that this is the prime and essential source of the disease and devote ourselves to the problem of trying to produce a vaccine with which to treat it. In certain conditions, however, we cannot isolate a specific bacteriologic cause for symptoms which in themselves are suggestive of infection, and we are forced to fall back upon what we designate autointoxication and assume that there is some undiscoverable source of infection in the body. In certain of this latter group of cases we are coming to the conclusion that anatomic visceral defects are capable of setting into operation faulty functional processes within the abdominal cavity, and that the patient becomes poisoned by the consequent interference with the machinery by which he should be rid of his waste physiologic products. In these cases nothing is brought in from the outside that was not already there, as has been assumed to be the case in the first-mentioned group; but we must not lose sight of the fact that we have no satisfactory scientific explanation of what the factor is that must be present beside the infecting organism to make possible the development of any infectious disease. We satisfy ourselves by saying that this factor is lowered resistance. If we are honest with ourselves we can recall innumerable instances where we have looked long and in vain for any evidence of such lowered resistance in cases where there has been no question about the infection. Flexner has recently shown that the organism which was capable of causing anterior poliomyelitis in a monkey was being carried in the nasopharynx of the healthy parents of a child who was then going through an attack of this disease without causing any symptoms in the hosts. Arbuthnot Lane is performing as a routine measure an intestinal short-circuiting operation in all children with bone tuberculosis, on the theory that visceroptosis in some of its forms is the cause for these infections. Indefensible as this position of Lane's seems to many of us it may well be that the lesson we should learn from it is that we must be on the alert to discover in some anatomic lack of adaptation the link that is so often missing in furnishing a complete explanation of the phenomena of infectious disease. If as time goes on such interrelationships should prove to be of frequent occurrence and others should be discovered not now even suspected, our whole plan of attack upon disease as the enemy of mankind will of necessity have to be remodelled. Numerous suggestive interrelationships between functional disturbances in the special senses dependent upon primary anatomic defects in one of the special sense organs might be cited as in line with this suggestion. Disturbances in the function of certain of the ductless glands give rise to serious upsets in the metabolism of the body, causing disarrangements in the functional activity of organs having at least no direct anatomic connection with the gland in question. What it was that was directly

responsible for throwing the gland out of its proper functioning we are not in a position to say. Anatomic obstacles may reasonably well be looked to in explanation of a lack of functional adaptation here as elsewhere.

It is time, therefore, that all the knowledge which these years of activity on the part of trained clinical observers in special fields have accumulated, together with the results of laboratory research along physiologic and pathologic lines, should be made to converge upon the accumulation of anatomic data in our possession, which must be the foundation stone upon which every scientific conception of disease must rest. We must get away from the notions which have so strongly dominated our thought in the past, based upon a dead pathology. To be of help to us our pathology must be a living pathology and we must realize that most of the diseases which flesh is heir to are the result of perverted physiology. I believe that in the future we shall discover that anatomic defects, either congenital or acquired, will be at the root of physiologic perversions more often than we now appreciate.

Certain of the anatomic skeletal disarrangements have been carefully studied and some suggestive light has been thrown upon a type of joint trouble which Preiser has classed as static joint disease and about which he has written extensively.[1] He groups the joints under the heading of static units and shows how any defect in any member of a static unity causes every other member of that unity to suffer. As an example of how this works out he refers to the influence of a pronated foot or a knock-knee upon other parts of the static unit of which the foot and leg are members. So also in the arm he refers to the effects of a cubitus varus upon the shoulder girdle and the carrying function of the arm. He speaks of the effects upon the joints of a static unity in the way of interference with the use of the articular cartilages as an "incongruence," and says that the results of these incongruences are expressed through changes in cartilage, bone, and circulation, producing, as a terminal effect, disturbances in the nutrition of the joints. He points to the fact that these same disturbances or incongruences may be produced in joints as a result of old healed diseases, for example, tuberculosis, infectious arthritis, and juxta-epiphyseal osteomyelitis. Again, he shows that variations in the anatomic types of the pelvis, by rendering the normal bearing of the femoral head against the acetabular floor impossible, cause "incongruence" of the bones at the hip- and knee-joints which lead to permanent anatomic changes, interfering with function and giving rise to the symptoms of arthritis. It is impossible that such a condition as this in the pelvic girdle should exist for long without its giving rise to such disarrangements in the

[1] Amer. Jour. Orth. Surg., vol. x, No. 1.

relationships of the lumbar and low dorsal vertebræ to each other that they in their turn should not manifest similar evidences of "incongruence" of articular surfaces, limitation of motion, and impairment of function. The significance of these primal anatomic defects is enhanced if there is coincidently present an inherited tendency to a diathesis such as that commonly denominated hypertrophic arthritis. In the shoulder girdle, whether from postural errors or anomalous development, we frequently meet with symptoms referable to the hand, forearm, shoulder, and cervicodorsal spine, which are due primarily to anatomic disarrangement of this "static unit," and as a result of this there develop nerve-root compressions, articular "incongruences," continuous strains upon ligamentous and muscular structures, which are of themselves painful, and result in impairment of function. Any one of the above-mentioned phenomena is of itself more or less distressing, and will, if permitted to continue, eventually exercise a harmful influence upon the patient as a whole.

In the feet one is constantly brought into contact with patients who for one reason or another have neglected to give attention to minor static defects. The congested, swollen, and painful foot, which is normally flexible in spite of static defects, readily passes over into the rigid, contracted foot, in which there are articular "incongruences" and serious disability.

Preiser has grouped the symptoms of the statically diseased joints under three heads: (1) Difficulty in getting the joints to work easily and comfortably after prolonged rest; (2) relief from this difficulty after being limbered up; (3) renewal of pain and stiffness after prolonged use.

F. H. Martin,[2] in an article entitled "Perpendicular Pelvis," has called attention to anatomic anomalies of the bony pelvis which he believes to be a cause for the development of certain gynecologic difficulties.

Further citation of examples of this cause for symptoms having no other primal explanation than anatomic defect is hardly necessary for the purposes of this discussion. It will be noted that among these conditions which have been mentioned some are of congenital and some are of acquired origin. It is probable that under the right conditions and during the earlier periods of life faulty attitudes and the assumption of an habitually poor poise, whether sitting or standing, may graft upon the individual methods of the employment of the various muscle groups which permanently impair their efficiency, bring about faulty skeletal relations, and render difficult the application of the energy of the growing child to the activities which are an essential part of its growth and development. Even the superabundance of animal spirits, which

[2] Jour. Amer. Med. Assoc., July 29, 1912

is the heritage of the normal child, cannot overcome indefinitely the handicap imposed by skeletal incongruence, and many a case of physical incapacity and deterioration can be traced to this alone.[3]

If the old aphorism that "as the twig is bent so the tree inclines" has any application here it is evident that the time to prevent the more serious handicaps of adult life, which are of this character, is before the changes which render the figure incapable of remodeling have taken place. It is important that those who are custodians of the health, the physical efficiency, and mental vigor of the race should realize that the prime reason for insistence upon good carriage in youth is not for the sake of the appearance one makes, but for the absolute dependence of all, except the expressly endowed in these respects, upon their being able to meet the world without physical handicap.

Recently Dr. J. E. Goldthwait[4] has drawn attention to still another series of congenital skeletal anomalies that seem to have considerable significance. These are situated within the narrow limits of the pelvic girdle, including the last of the lumbar vertebræ. Here are anatomic structures capable of such disarrangement, either congenital or acquired, that they may give rise to physical incapacity and discomfort of considerable significance, and this without complication by any of the pathologic conditions common to bone. Some of these are the result of anomalies in development hitherto not supposed to have any clinical importance.

The primal condition of the progenitors of the human race was that of a creature whose progression was, in whole or in part, upon "all fours." To have evolved from this anatomic skeletal entity a creature whose progression is upon the posterior two of these original four legs has entailed considerable skeletal modification extending over periods of time which are almost inconceivable. The necessities of adaptation to a changing environment and to changing conditions of existence have been responsible for the varying degrees of conformity to a normal standard observed in various parts of the bony skeleton. Evolution in the osseous skeleton is progressing just as it has been in other and more thoroughly studied parts of the body, and the perfect adaptation of the body as a whole and in all its parts to the requirements of function and environment has not yet been attained. Until that period it is probable that we shall be obliged to employ our ingenuity and thought in trying to find some way to overcome the failure of the slow plodding evolutionary processes to meet the physical necessities of the organism.

One of the regions where the greatest evolutionary change has taken place in transforming a quadruped into a biped is at the

[3] The Relation of Posture to Human Efficiency, J. E. Goldthwait, M.D.

[4] Boston Med. and Surg. Jour., March 16, 1911, pp. 365 to 372.

juncture of the pelvic girdle with the trunk. Here there had of necessity to be very great modification in the coarse as well as in the fine adjustment of the parts. Here we find considerable variation in the size, shape, and alignment of skeletal structures. When the pelvis was adapted to sustain the weight of the posterior part of the body at right angles to the method of the biped and the muscles originating on the pelvis and operating the legs exerted their stress in a manner not now employed the inclination of the pelvis was different, and the way in which many of the articular facets inclined as well as their shape had of necessity to undergo modification. Between the four-legged progression of remote quadruped ancestry and the present human carriage there was developed the monkey, whose method of progression was in part one and in part the other, that is, in part quadrupedal and in part bipedal. A pronounced modification of the pelvic girdle had of necessity to be made in order to make such a dual method of progression possible. Now in man we have departed so far from a pelvic development of the type that prevails in the monkey that man could not if he chose, except in the earliest years of life, progress in any other way than on his "hind legs."

The sacrum varies greatly in size, in shape, and in the inclination with which it meets the other pelvic girdle bones. Besides these gross variations there is a variation in the shape and inclination of the articular facets. There are wide variations in the last lumbar vertebræ. In some cases the fifth lumbar has been sacralized; in others the transverse processes of the fifth are so long that they impinge upon the sides of the ilia. They are bent upward in some cases. At times there is an articulation between the tip of the transverse process and the ilia or there may be a joint between the inferior surface of the fifth transverse process and the sacrum. In still other instances there are bursæ between these fifth lumbar processes and the sacrum or the fifth and the ilia. Another anomalous situation is seen where the fifth lumbar and the sacrum are fused. This may be the case on one side, whereas on the other there is the normal anatomic condition. In some specimens there is a wide variation in the size, shape, and inclination of the articular facets on the fifth lumbar, with corresponding changes in the sacral articular processes. In those variable anatomic relations one finds the possibility of various disturbances, some of which are purely static and others are the sequels of primarily static disarrangements.

We have here in this small compass the potential of sprains of articulations between the facets holding the last lumbar upon the sacrum as well as between the supernumerary joints which may exist between the sacrum and the transverse processes of the fifth lumbar and the fifth lumbar and the ilia. Also bursal irritation in bursæ located as above described. Because of the departures

from the normal in the size and shape of the articular facets occasionally there are dislocations or luxations of these facets with the signs of such anatomic disarrangements added to the signs of sprain. Furthermore, the posterior nerve roots making their exit below the transverse processes of the fifth lumbar may be compressed by the disturbed relationships of the sacrum and the last lumbar, sciatic symptoms being thus produced. Accompanying such static disarrangements we may find evidence of various arthritic lesions, notably the hypertrophic type and other nontuberculous forms of infectious arthritis, more rarely tuberculosis. Associated with many of these lumbosacral strains the sacroiliac articulations may be involved, especially in those where the cause is one which has operated over a long period of time.

It is a specious form of logic which seeks to draw conclusions from a comparison of the behavior of two mechanisms as unlike as the most complicated machinery that man's ingenuity has constructed and the mechanics of the human body, but granting this, the fact still remains that mechanical laws are true for both and the effects of stresses, weights, and pressures of various sorts, whether in the body or in the machine, produce effects in obedience to mechanical laws common to both. Wolff's law regarding the principles of trabecular architecture in the structure of bone is an evidence of this. The materials out of which the human body is made and the biologic conditions governing growth and repair add factors which do not have to be reckoned with in the machine when interpreting the effects of faulty mechanical usage, but this constitutes one of the main differences between animate and inanimate mechanisms.

There has been a universal interest manifested in the past few years in visceral ptosis. This has been shared among surgeons, internists, and by some of those interested primarily in the specialties of gynecology, orthopedic surgery, and pediatrics. As a result of the studies evoked by the anatomist it has developed that this condition is widespread; that about one person in every five has some form of this anatomic defect; that though often acquired it is perhaps more frequently congenital, and that its influence upon growth, development, the etiology of various diseases, and general physical vigor or health in its broadest sense is considerable. As is always the case when any new departure is being made there are those whose natural conservatism restrains them from taking any active part in the movement. There are others whose scientific training puts them on the defensive at once; these are those who refuse to accept the suggestive data which have been accumulated by the pioneers in the work as indicating at all that such clues should be followed out. There are also those who swallow the bait and run away to extremes that there is no justification for even in the wildest stretches of the imagination. It remains for

those who first picked up the trail to quietly persist in the search for further confirmation of the truth of their earlier suspicions. This is the present-day situation in regard to visceral ptosis, and the more apparent it becomes that a study of the terminal lesions is not destined to afford much of an explanation of the cause of the disturbances, but that primary, structural, anatomic defects may be looked upon to furnish the reason for the existence of these deformities—for that is what they would be called if we could see them with the naked eye—the more satisfactory are bound to be the results of treatment. The chances of getting at the truth of such a matter as this are hampered because of the fact that we are dependent upon at least two of the above-mentioned types of mind for the accumulation of necessary data. The operating surgeon rarely has the time to make any observations other than those incident to the technique of his operation and the pathology concerned and it is necessary that some one else should make the observation. The representative of the second type knows that it would be unscientific not to investigate, but proceeds to carry on his investigations in a spirit infinitely more reprehensible from the point of view of scientific research, in that he is a prejudiced observer from the start. The greatest harm of all, however, is done by those who without capacity for investigation, and with the commercial, though it may mask under the term scientific, spirit proceed to discover that visceral ptosis is the cause for all bodily ailments and resort to abdominal surgery for their relief.

An intelligent outlook upon the whole question will tend to correct the errors inherent in the point of view of all three different observers. The best corrective for these errors lies in an anatomico-physiologic conception of the situation. This point of view is the one that offers the most in the way of explanation of the factors leading up to the establishment of ptoses. It makes intelligible many of those conditions which seem to be the sequels of these deformities, and it supplies the basis of a rational therapy which is both preventive and corrective. There are among the ptoses two conditions at least; for purposes of description they might be classed as acute and chronic. To the first class belong those cases in which the fundamental anatomic developmental stage has not gone so far as to result in modification of physiologic function, at least to any serious degree. To the second class belong those cases in which the persistence of the anatomic anomaly has resulted in such functional physiologic maladjustments that no mere readjustment of what were the causative, primal anatomic defects is capable of restoring health. Indeed in these cases readjustment of the anatomic defect may no longer be possible.

So much more that is vital is dependent upon the normal function of the intestine than upon the normal function of a joint, or indeed of several joints, that anatomic disarrangements of the

intestinal tube or other of the abdominal viscera intimately related to this functionally must of necessity give rise to more serious disturbance than any disarrangements of anatomic structures in the osseous skeleton. This is, of course, on the assumption that normal anatomic arrangement has something to do with physiologic function. In the case of the skeletal defects such interrelationships have been definitely shown. This gives, *a priori*, ground for the assumption of such interrelationships in the abdominal cavity and opens up a wide field for anatomic and pathologic research as well as for investigation of various problems in the physiologic chemistry of the body. The most obvious disturbance as a result of congenital ptosis of the intestine is the mechanical one, whereby the passage of the food through the intestine is slowed down, and constipation is often the most obvious if not the only unpleasant effect. The secondary disturbances attributable to a sluggish condition of the bowel usually receive but little attention or have but little significance attached to them. An occasional or even an habitual use of catharsis is usually the maximum amount of attention bestowed upon the symptom. Headaches, malaise, offensive breath, anorexia, etc., are taken as a matter of course and ascribed to constipation. Later on as the mechanical difficulties under which the intestinal tube has been operated have increased because of dilatation behind the point of greatest resistance, and because of the other mechanical sequels of the primary maladjustment, the original symptoms are less and less conspicuously mechanical and may become of more serious import. Among the more important of these are the various "kinks" and ileus. Chronic states of ill health, the causes of which are frequently attributed to its most conspicuous symptom, which symptom has to bear the brunt of the therapeutic batteries directed against it, and more often than not successfully withstands the attack. Chronic arthritis may be the form that the fundamental congenital defect brings to the front, or it may be that there are many other of the disease entities which our ignorance of the complexity of interrelations of biologic processes has caused us to establish the practice of referring to these visceral conditions as their cause.

Certain it is that after the mechanical phases of this maladjustment have been in operation for a time that then functional derangement of the gut sets in. It not only fails to move its contents along at a proper rate of speed, but it soon loses apparently some of its value as an absorptive membrane. At the same time the character of its contents becomes altered because of the fact that it has failed in the mechanical part of its function. All the functions of assimilation, so far as they are located in the intestine, become more or less perverted. As the condition becomes more advanced, digestion and body metabolism must be involved also, because one of the most conspicuous gross changes noted in the

intestinal coats in marked cases of this sort is the atony and excessive thinning out of the walls of the intestine. This can scarcely fail, it would seem, to have some effect upon the physiologic activity of such glands as are situated in its walls.

There is reason to suppose that the multitudinous physiologic activities of the body, though they may be able to go on abnormally for some time without any very gross evidences of their maladjustment, must work together in absolute harmony in order that the functions of the organism be continuously at their highest degree of activity and that the efficiency of the individual be kept at its maximum. This state of equilibrium means health.

From what has been suggested by the foregoing it would seem evident that any measures which tend to prevent the establishment of conditions wherein faulty metabolic processes are being put in operation must be employed. In so far as these are dependent upon correctable skeletal defects, benefit will follow the employment of measures directed to the correction of such defects, and in proportion to the capacity for correction will be the benefit to the physiologic disturbance.

I have endeavored to suggest one or two ways in which the skeleton when abnormally set up may unfavorably influence the health. These have been the more obvious and better understood ways. There are many others, apparently the outgrowth of those already suggested. The part played by the ductless glands is more completely beyond knowledge at present possessed than any other physiologic process. How the function of these glands may be influenced by such physiologic disturbances as have already been spoken of it is impossible to say, but it is reasonable to suppose that they may be definitely unsettled in their activities in this manner.

It is easily understood that one of the effects produced by a pronounced visceral ptosis may be exerted upon the circulatory system in the abdominal cavity. The initial effects may be mechanical, but the remote effects may readily be physiologic. The primary disturbance may be an interference with the arterial circulation, restricting blood supply, or upon the venous circulation disturbing the return of blood from the viscera. How such disturbances may affect the functions of such important organs as the spleen and the liver, whose circulation is derived from the celiac axis of the abdominal aorta, can only be surmised. Again, it requires no great stretch of the imagination to see that the lymphatic circulation in the mesentery may be harmfully influenced by conditions of visceral ptosis. The nervous system, though consciously to us only a means of reflecting emotions to our sensoria, enabling us to act in the light of impulses which it conveys, is, nevertheless, of far more importance than such a conception would imply, and has interrelations with the organs of circulation, assimilation, and

digestion which it is highly important should be kept within normal limits in order that the functional activities of the vital organs, so-called, should be capable of being carried out naturally. In childhood and youth such general processes as growth may well be influenced by the train of functional disturbances set in operation by a skeletal anomaly, whether congenital or acquired. This may apply to mental development as well as physical.

These problems comprise much of the work that those who are becoming interested in chronic medicine have lain out for themselves. A new and attractive field for investigation exists. Light is being shed upon many questions which have puzzled all branches of the profession of medicine. The need for a correlation of the knowledge which has been accumulated through the activities of workers in various special lines of research is becoming more and more evident. We are getting past the period when within the narrow limits of our particular spheres of activity we can assume a position of authority and say that this or that ailment can be treated properly only by this or that specialist. It can be properly treated only by the one who has the best conception of the anatomico-physiologic relations of the condition before him, and is broad enough to act on that knowledge. A better conception of the functional anatomic relations of the human being, not merely the ability to recognize and call by name its structural components, is what is necessary in medicine and surgery. When the profession recognizes this and bases its treatment upon such knowledge, some at least of our present-day problems are certain to become easier of solution, and mankind at large will be the gainer.

THE VALUE OF X-RAY EXAMINATIONS IN THE DIAGNOSIS OF ULCER OF THE STOMACH AND DUODENUM.[1]

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The diagnosis of ulcer of the stomach and duodenum is at times a most difficult problem. Not infrequently important symptoms are absent and the cases then become so atypical, that any

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additional aid in diagnosis must be looked forward to with great satisfaction. The *x*-rays have presented us with an important additional means of diagnosis in the study of this affection. While we do not believe that this method is as yet sufficiently well developed to be relied upon alone, yet we are confident that it often offers most valuable assistance as an aid in diagnosis of quite as much practical value, as any of the important symptoms of the disease, and taken in connection with the other signs is of the greatest diagnostic help. We have selected from our 80 cases of peptic ulcers, in which *x*-ray examinations have been made, 20 for this report, including those only concerning which we could feel confident as to the correctness of the diagnosis. Of these there are 10 cases of duodenal and 10 cases of gastric ulcer. Three of these cases (V, XV, and VIII) were operated on, and the diagnosis was thus confirmed. Three others (XII, XVIII, and XIX) had been operated on, and the ulcers revealed at the time of operation, but were not interfered with, while the remaining 14 presented such typical symptoms of ulcer, including the presence of blood in the stools, that the correctness of the diagnosis in these, too, remains undoubted.

The cases were first studied clinically, and then without any note being given as to the nature of the disorder, were sent for *x*-ray examinations. The two reports were then placed side by side and the clinical and *x*-ray diagnoses corresponded so closely in every instance as to make the results appear most striking.

The *x*-ray diagnosis of gastric ulcer and duodenal ulcer has engaged the attention of the Röntgenologist ever since the production of high-power apparatus has made it possible for us to get practically instantaneous *x*-rays of the gastro-intestinal tract.

It is, however, only in the last two years that we are really beginning to observe results upon which some reliance may be placed. The old theory that there is a possibility of diagnosticating ulcer by bismuth adhering to the raw surfaces is now practically abandoned inasmuch as experience has taught us that this rarely happens because of the fact that the irritability of the raw surface produces hypermotility, with violent contractions, so that it is almost impossible for the bismuth to adhere to the raw surfaces.

At present we are relying more upon the functioning of the stomach and intestines than upon the actual demonstration of the ulcer. Curiously enough, the diagnosis of duodenal ulcer is much simpler than that of gastric ulcer. One can practically always rule out the presence of a duodenal ulcer, but one cannot always rule out the presence of gastric ulcer. The true line of distinction is the fact that in an irritating lesion of the stomach, such as an ulcer, the hypermotility produced by it causes a tonic contraction of the pylorus, with consequent retention of gastric contents, over a

shorter or longer period, according to the situation of the ulcer, and also the deformity that the lesion may produce. On the other hand, in a lesion of the duodenum, we have again a hypermotility not only of the duodenum but of the stomach itself; but in this case we do not have the spastic condition of the pylorus, and consequently the hypermotility produces a rapid emptying of the stomach contents. For example, in our experience in simple ulcer of the duodenum not complicated by adhesions we find the stomach will invariably empty the greater part of its contents in from fifteen to twenty minutes, and will be completely emptied in from forty minutes to an hour. In gastric ulcer we have just the reverse. There will be the primary quick expulsion of contents and then the spastic condition of the pylorus appears, and we have a retention, varying anywhere from two to four hours, depending upon whether the lesion is a simple one or complicated by adhesions.

Let us take up the consideration of the duodenal ulcer. Our experience seems to show that there are certain characteristic features connected with this lesion, which are more or less present in all cases. We have decided hypermotility, yet the contractions are quite uniform, and there is no tendency toward hour-glass formation of the stomach. The pylorus is patulous, and the bismuth flows quite freely into the duodenum. The duodenum is in active contraction, and in many of the uncomplicated cases we find that there is a vacant area in some portion of the duodenum, and this area will persist throughout the period of the examination. At times we may observe bismuth running along either side with the vacant area between the bismuth.

Whereas this has not been proved experimentally, yet we are inclined to believe that this vacant area is the seat of the ulcer, and owing to its raw surface and irregularity the bismuth does not adhere to it; consequently we have this area free, which for want of a better name we have termed "vacant area." In all of the cases we do not have this area free from bismuth, and we are inclined to believe that this fact is dependent entirely upon the condition that the surface of the ulcer presents at the time of the examination. In two of our cases (E. L. R. and J. P.) which have not been included in this report, and in which there had been a fresh hemorrhage within twenty-four hours previous to examination, we have found that it is extremely difficult to observe bismuth in the duodenum; the entire duodenum being in such a state of irritability with consequent hypermotility that the bismuth would be shot through the duodenum almost instantly. Then we have another class of cases with active symptoms where the ulcer was not of long duration, and yet apparently not complicated by adhesions. In these cases the vacant area occurred most frequently (II, III, IV, VIII, XI, XII, XIII, XVII). In the third type of cases in which the ulcer was complicated by the

formation of adhesions, the vacant spot was practically absent. We can account for this by the fact that the adhesions probably lessen the hypermotility of the duodenum, and consequently the bismuth cannot be expelled so quickly from the raw surface. (Cases XII and XIX.)

The first two classes of cases are the most easily diagnosticated. Care, however, must be taken not to confuse them with another condition in which we may have a rapid emptying of the stomach, namely, with hypochlorhydria (achylia gastrica). In this condition we have a patulous pylorus, so that the stomach contents flows through quickly and freely. This condition, however, is not characterized by the same active contraction as we usually have in the duodenal lesion.

Nothing but the clinical findings would differentiate these two points absolutely. The third type of cases, in which we have an old ulcer complicated by adhesions, is the most difficult to determine. Here the duodenum, and even the stomach, may be so tied up with adhesions as to interfere seriously with the motility of these parts, but even in these cases we find that the stomach is making a determined effort to expel its contents, and shows all the evidences of hypermotility, and at the same time we do not see any bulging of the walls around the pylorus, such as is commonly seen when we have a true obstruction in that region. The duodenum is likely to show constrictions at the seat of the lesion, and if the ulcer is still present we may or may not have a vacant area. The stomach contents as a whole is expelled more quickly than in a normal stomach. In the case of F. H. M., a male, aged sixty-one years, who presented many symptoms of duodenal ulcer, but had no blood in his stools, and who had a marked gastric and duodenal hypermotility, together with the vacant area in the duodenum, an ulcer was not noted at operation, though the duodenum was not opened; however, a band of adhesions was present connecting the duodenum with the gall-bladder.

Our general conclusions in reference to duodenal ulcer are these: There is excessive hypermotility of the stomach, with rapid emptying of contents, so that the greater portion of the stomach contents is emptied within the first half hour, the stomach contraction being practically normal, and there is no evidence of hour-glass formation. There is hypermotility of the duodenum, with formation of a vacant area which remains fixed in all the examinations. The presence of a duodenal ulcer in simple cases uncomplicated by adhesions can practically always be determined.

In gastric ulcer we are dealing with a much more difficult question. Here the question of the normal motility of the stomach is still open to debate, as evidenced by the fact that various authorities have given from two to six hours as being a normal period

for expulsion of the bismuth contents. At present it seems to us that the gastric ulcer can be diagnosticated in certain situations only. From the *x*-ray standpoint we are able to see practically only one surface of the stomach and a portion of the greater and lesser curvatures. Should the ulcer be situated on the posterior surface of the stomach near the lesser curvature, it is not visible because the bismuth contents of the stomach completely obscures that side, consequently we are unable to see any alterations or irregularities of the peristalic waves. It is only when the lesion is situated on the anterior surface of the stomach, and along the anterior surface of the lesser and greater curvature, that we can come to any conclusion. If the lesion is on the lesser curvature close to the pylorus, by making repeated examinations of the stomach we are able to see irregularities in the peristaltic waves, due to the induration and partial fixation of the ulcer.

If the ulcer happens to be in the profile we might obtain an irregular area not covered with bismuth. Here again we have active contractions with primary rapid expulsion of contents, so that we will almost invariably find the Bishop's cap filled. (We are speaking now, of course, of those ulcers which are not in the pylorus itself, and producing active obstruction.) We get an excessive irritation from the ulcer with a consequent hypermotility, and a spastic condition of the pylorus, so that for the time being there is practically no expulsion of contents. It is only when this spasticity relaxes that a portion of the bismuth is expelled. The act of expulsion, it seems, sets up in waves, and again we have a complete closure of the pylorus, so that the expulsion instead of being regular and rhythmical is decidedly spasmodic and in spurts. When the ulcer is situated just within the pylorus we may have absolute retention over a period of several hours more than normal. And again when the bismuth is expelled it may come in two streams, appearing as if there were some obstruction, with small apertures on either side. In these cases we have found that this vacant area in the pylorus is due to the ulcer, and the excessive irritability has almost diverted the stream to each side of it. In gastric ulcer, whatever its situation, we can always look for retention of contents. Notwithstanding the hypermotility of the stomach, we do not have a hypermotility with expulsion of contents, but, on the contrary, retention.

In these lesions we frequently find a tendency to hour-glass formation, due to spasmodic contraction, with all the stomach contents in both the upper and lower poles. This has never been observed in duodenal ulcer. (Cases I, IV, V, VII, IX, X, XIV, XV, XVI, XX.)

The diagnosis between gastric and duodenal ulcer from clinical signs alone is often very difficult, and many clinicians consider it impossible in many instances to differentiate between the

two. The *x*-ray findings of the two conditions differ, however, so markedly that this method affords an almost positive means of differentiation.

Since we have taken up the positive phase of ulcer it is wise to draw some conclusions as to the negative finding. In the first place we believe that we can rule out positively the presence of a duodenal ulcer. If we observe that the stomach contents are not expelled promptly, and that the greater portion remains after the lapse of an hour, we can maintain confidently that the trouble is not in the duodenum. Even in the old chronic ulcer, with adhesions, the motility is so marked that it cannot be overlooked. The negative diagnosis of gastric ulcer is not so certain. So many complicating phases are present in these cases that the retention of bismuth in the stomach does not appear to have the same significance as the hypermotility in duodenal ulcer. As has been pointed out in gastric ulcer, we have a spastic retention. In simple atony and in prolapse we may have retention, and yet the spastic character of the retention is not present, nor is there any tendency toward the formation of an hour-glass stomach.

Another very important point, which our studies have brought out in connection with duodenal ulcers, is that in a rough way we can approximately determine the degree of healing of the ulcer. In duodenal ulcer, when the patient is given the rest treatment and placed upon the proper diet, all symptoms will gradually disappear, and the patient will become, comparatively speaking, well. This usually takes place in from four to five weeks. At the end of this time, however, if a second bismuth examination be made, we will usually find the same characteristic signs present as in the fresh ulcer, though the patient shows no symptoms whatever. In a series of cases of duodenal ulcer, that have been examined from three to five weeks after the absence of symptoms, we have practically found no change in the motility of the stomach. (Cases II and XVII.) The same hypermotility persists, indicating that there is still an irritating lesion present in the duodenum.

When these patients are given the ordinary diet their symptoms are apt to recur in a short time. If treatment, however, is continued longer our experience has demonstrated that as the ulcer continues to heal the motility of the stomach returns to a more normal condition, and by making repeated observations over a long period of time we can observe by the *x*-ray examinations when the ulcer is healed (Case III). There can be no question but that this is one of the most important findings of this kind of work, inasmuch as until this method was employed there was absolutely no means of determining whether ulcers had healed or not. Our only means of determining this question has been by a return of symptoms, when the patient was placed upon an ordinary diet, and this simply means a relapse for the patient.

By means of *x*-ray examinations made from time to time we are thus enabled to determine the progress of healing.

Conclusions. From our studies of the twenty cases of peptic ulcer in which *x*-ray examinations were made, together with our experience with many other cases, we believe that we are justified in drawing the following conclusions.

1. The *x*-ray offers most valuable assistance as an aid in the diagnosis of peptic ulcer; and although this method is not yet sufficiently well developed to be relied upon alone without entering into the clinical aspect of the disease, it is of the greatest diagnostic help in obscure cases.

2. In duodenal ulcer there is an excessive hypermotility of the stomach, with rapid evacuation of the contents, so that the greater portion of the gastric contents is emptied within the first half hour; there is hypermotility of the duodenum, with formation, usually, of a vacant area, which remains fixed in all of the examinations.

3. The diagnosis of gastric ulcer can only be made in certain situations: that is, when the lesion is situated on the anterior surface of the stomach, and along the anterior surface of the lesser and greater curvature. We have in this condition an excessive irritation from the ulcer, with a consequent hypermotility, and a spastic condition of the pylorus, so that for the time being there is practically no expulsion of the bismuth. It is only when the spasticity relaxes that a portion of the bismuth is expelled. In gastric ulcer, whatever its situation, we can always look for retention of contents. In certain instances there is a vacant area in the pylorus; there is frequently a tendency to hour-glass formation.

4. The *x*-ray affords an almost absolute means of differentiating between gastric and duodenal ulcer.

5. By means of the *x*-ray we can positively rule out the presence of a duodenal ulcer.

6. We can approximately determine the degree of healing of an ulcer which cannot be as certainly determined in any other way.

We append a brief abstract of the histories of our cases.

Case I.—February 5, 1911. Gastric ulcer. C. G., female, aged sixty-one years. The patient had had symptoms of indigestion for two years, consisting of pain, pressure, and fulness after meals, and nausea but no vomiting. The symptoms were more marked after solid than with liquid foods; they had become more and more intense, until the patient vomited large amounts of the undigested food; she had lost but a small amount of flesh, and the discomfort after meals had gradually become more aggravated. On examination peristaltic movements were visible, and an extremely painful area in the epigsatrium presented itself. There was no palpable mass in the abdomen; the gastric contents showed a total acidity of 40; free hydrochloric acid was absent. There

was an absence of lactic acid and the Oppler-Boas bacilli; blood was, however, present. A retention meal was given at night, and the stomach washed the following morning, when a large quantity of the food remains was returned. Occult blood was observed in the stools. A diagnosis of gastric ulcer with obstruction was made (notwithstanding the absence of free hydrochloric acid), because of the character of pain after meals, the duration of the disease, and the slight loss of flesh.

An *x*-ray examination revealed a stomach situated high up, with an extremely bulbous pylorus, and definite retention due to obstruction was noted. The patient was operated on April 3 by Dr. J. M. T. Finney. A thickened pylorus with obstruction was revealed, together with multiple ulcers in this region. A pylorectomy was performed and the patient made an uneventful recovery from the operation.

CASE II.—December 2, 1902. Duodenal ulcer. W. T., male, aged forty-seven years. The patient had had indigestion for several years, with periods of complete remission, lasting several weeks to a month. The indigestion consisted of pain in the epigastrium two hours after meals, which was relieved by food, as well as when in the recumbent position. This discomfort was less with liquids than with solid food. On examination an epigsatric painful point was revealed. No other tender areas were observed. The gastric secretion presented a total acidity of 60; free hydrochloric acid, 60. Occult blood was present in the stools.

An *x*-ray examination presented an extreme gastric hypermotility, with rapid expulsion, the stomach being completely empty in an hour and a half. In the duodenum there was a small vacant area, at which bismuth was found absent, though there was bismuth in front of it and behind it ("vacant area").

CASE III.—November 26, 1912. Duodenal ulcer. C. F. B., male, aged sixty-one years. This patient had had numerous attacks of gastric pains extending over periods of from two to three months for the past ten or twelve years. These pains would appear two hours after meals, and would be temporarily relieved by food and by alkalies, and would also disappear when the patient was in the recumbent position. Tarry stools were present in one attack. The last attack had been present for about two months. The patient had lost eight to ten pounds in weight. A gastric analysis, made during a former attack (four years before), revealed a total acidity of 96; free hydrochloric acid, 78; occult blood was present in the stools.

An *x*-ray examination showed an extreme hypermotility of the stomach, with an area in the duodenum uncovered with bismuth ("vacant area"). On March 31, 1913, another *x*-ray examination was made. Hypermotility was present, but not to the same degree as in the previous examination. This would indicate that the

ulcer was going on to a healing stage. It was not so active as in the previous examination.

CASE IV.—December 27, 1912. Gastric ulcer. J. S., female, aged thirty years. Patient had been suffering acutely for the past three weeks with marked epigastric pain, passing into the back between the shoulder-blades. The pain was most acute immediately after taking food, and much more so after solid than liquid food. She was relieved when in the recumbent position. There was frequently nausea and occasionally vomiting. The patient had vomited small quantities of blood. The gastric contents presented a total acidity of 54; free hydrochloric acid, 48; blood; a bit of necrotic tissue; occult blood was present in the feces.

An *x*-ray examination showed a somewhat bulbous pylorus, which at times appeared in a state of extreme tonic contraction, the bismuth, however, going through very rapidly. From the state of tonic contraction and bulging of the stomach there must have been some inflammatory condition within the stomach just at the pyloric ring.

CASE V.—September 20, 1912. Gastric ulcer. S. M. B., male, aged fifty-six years. (Case referred by Dr. Boyd, of Jacksonville, Florida.) The patient had been affected for a number of years with gastric disturbances, with remissions for variable periods of time (from two weeks to a month). The attacks were characterized by pain coming on a short time after meals, *i*, *e*., in from fifteen to thirty minutes; they were accompanied by nausea and occasionally by vomiting. Eructations of gas and acid eructations were frequent. The distress was increased on taking solid food, and was less on liquids; it was also lessened when the patient was in the recumbent position. On examination an epigastric painful area was manifested. The gastric contents presented a total acidity of 74; free hydrochloric acid, 0.21 per cent.; occult blood was present in the stools.

An *x*-ray examination revealed a persistent absence of bismuth about the junction of the duodenum and pylorus (vacant spot), the motility of the stomach being markedly increased. Dr. Boyd operated on the patient on December 1, 1912, and found a pyloric ulcer evidently of long standing, and there was marked induration and quite a puckered condition of the stomach wall at this site.

CASE VI.—May 21, 1912. Duodenal ulcer. D. S., male, aged thirty years. The patient had had three distinct attacks of gastric disturbances of the same character. The first attack occurred three years before, the second attack a year later, and the present attack began a few weeks ago. Between the attacks the patient was perfectly well, and could partake of all kinds of food. The attacks began with heart-burn, pressure, and an uncomfortable sensation in the region of the stomach, which was soon followed

by pain; the pain appeared several hours after meals, and was relieved by food; the pain was usually relieved when the patient was in the recumbent position, as well as by alkalies. The pain appeared frequently at night, awakened the patient, but lasted only for a short time. On examination the patient presented a painful epigastric area. The gastric secretion showed a total acidity of 80; free hydrochloric acid, 0.21 per cent. There was occult blood in the stools.

An *x*-ray examination showed a marked gastric hypermotility, seven-eighths of the bismuth having been expelled from the stomach in forty-five minutes; there was also an area in the duodenum just in front of the pylorus, where no bismuth remained. In none of the plates would any bismuth adhere to this small rounded area, which was about the size of a 5 cent piece, bismuth appearing on both sides of it ("vacant area"): there was in addition a decided hypermotility of that portion of the duodenum, bismuth passing through that area with unusual rapidity. With this hypermotility and with the vacant area in the duodenum the diagnosis of duodenal ulcer was confirmed. There was in addition a much dilated cecum, prolapse of the ascending and transverse colon, and all were firmly bound down to the cecum.

CASE VII.—December 20, 1912. Gastric ulcer. J. W. P., female, aged forty-seven years. This patient was first affected with the digestive disturbance two years before; at that time she complained of pain appearing two to four hours after meals, heartburn, and acid eructations. The pain was relieved by the taking of food and by alkalies. There was no difference as to the production of the pain, in relation to the food, solid food causing as much pain as liquids. The pain always disappeared, however, in the recumbent position. An examination at that time revealed an epigastric painful area; a gastric contents with a total acidity of 100; free hydrochloric acid, 54; occult blood was present in the stools. A diagnosis of duodenal ulcer was made and a Leube rest cure undertaken; the patient recovered entirely in the course of six weeks, and was able to partake of all foods without discomfort. On December 20, 1912, she again presented herself for treatment. For the past four weeks she again complained of gastric pain, appearing fifteen or thirty minutes after meals, with distress from gas, some eructations, nausea, vomiting of an acid secretion, and at times a brownish matter; great relief was experienced from vomiting as well as when the patient was in the recumbent position. An examination revealed an epigastric and dorsal painful area; a gastric contents with a total acidity of 84; free hydrochloric acid, 0.22 per cent.; and blood; tarry stools were likewise observed. There was no evidence of peristaltic movements, and after a retention meal given at night the stomach was found perfectly empty the following morning.

An *x*-ray examination revealed a long vertical stomach, the greater curvature lying well below the crest of the ilium. Active motility was present, but the pylorus was very irregular in shape, and the stomach around the pylorus was bulged out, showing definitely that there was some obstructive condition at the pylorus itself. Notwithstanding the active motility of the stomach a good portion of the bismuth was still left in the stomach at the end of two hours. The delay in expulsion was due to a great deal more than the extreme prolapse, and was in all probability due to an ulcer.

CASE VIII.—January 11, 1913. Duodenal ulcer. C. G., male, aged thirty-four years. This patient had had attacks of indigestion for the past four years, lasting from two or three weeks to three or four months at a time. The attacks were all characterized by similar symptoms. He had been affected with the present attack for the past four months. The symptoms complained of consisted of pains in the region of the stomach, appearing four or five hours after meals, which were intense at times, and which were relieved by the ingestion of food and also by soda bicarbonate. The patient was extremely constipated and had lost fifteen pounds in weight. He complained of the acid eructations, but was not nauseated, and did not vomit. An examination of the patient revealed a painful area to the right of the median line. The gastric contents showed a total acidity of 88; free hydrochloric acid, 0.21 per cent.; occult blood was present in the stools.

An *x*-ray examination presented the stomach in a state of excessive hypermotility, with rapid expulsion of the bismuth contents into the duodenum. Just outside of the pylorus and in the first portion of the duodenum there was a ragged area in which no bismuth was found ("vacant area"). This persisted in several plates, and from this, together with the hypermotility of the stomach, we could say confidently that there was an ulcer in the duodenum causing this change.

CASE IX.—January 8, 1913. Gastric ulcer. J. G., female, aged fifty years. The patient had been affected with the present condition for the past two years; at times entire relief was obtained for a period of from two or three weeks. The symptoms complained of were a burning sensation in the region of the stomach, pain soon after the ingestion of food, followed by nausea and frequently by vomiting. The pain was so increased on taking solid food that the patient had almost entirely discontinued solids, and was living on liquids. The quantities vomited were usually small in amount, and there had never been any evidence of food taken the day before in the vomitus. The symptoms had been markedly lessened since she had been on liquid diet; the patient found great relief when in the recumbent position. An examination of the abdomen revealed an epigastric painful area, exquisitely painful

to pressure. The gastric contents presented a total acidity of 70; free hydrochloric acid,62; occult blood was present in the stools.

An *x*-ray examination presented a large stomach, the pylorus drawn well over to the right side, and lying rather high up. The motility of the stomach was good, but the expulsion was poor, indicating the presence of some inflammatory condition in the stomach, causing retention. On account of the abnormal position of the stomach well over to the right side one had to take into consideration adhesions, but from the position of the stomach and the way it was functioning we believe that we had an inflammatory condition of the pylorus in the form of an ulcer, producing retention, with adhesions outside, holding the stomach in an abnormal position.

Case X.—January 7. 1913. Gastric ulcer. C. R., male, aged twenty-five years. The patient had been affected with indigestion for the past three months. His complaints consisted of pain fifteen to thirty minutes after eating, followed by nausea and vomiting. His pain was entirely relieved by vomiting. He had much less difficulty with liquid food than with solids; he was much annoyed by heart-burn, acid eructations, and gas, and was markedly constipated. During the past three months he had frequently observed tarry stools. On examination a tender epigastric area was revealed which was exquisitely tender to pressure. His gastric contents presented a total acidity of 56; free hydrochloric acid, 42. A retention meal given at night revealed the stomach empty when followed by lavage the next morning. There was occult blood in the stools. An *x*-ray examination presented a prolapsed and enlarged stomach, yet notwithstanding this the organ appeared actively motile. Bismuth was expelled with some difficulty, so that there was some retention at the end of three hours. In all of the plates there was an irregular area, to which bismuth did not adhere, just inside the pylorus at the lesser curvature of the stomach.

We were here dealing with a gastric ulcer situated at the lesser curvature just within the pylorus.

Case XI.—January 18, 1913. Duodenal ulcer. A. W. M., male, aged twenty-three years. The patient had had disturbances with his digestion for the past year. He had pain in his stomach two hours after meals, which was temporarily relieved by food as well as when he was in a recumbent position. He had less distress from liquids than from solid foods. The pain was distressing at times, but could always be relieved by the ingestion of food; even the drinking of hot water relieved it. The patient had not had nausea or vomiting, but was constipated; was nervous and suffered with headaches. On examination an epigstric painful area was revealed, also a painful area in the back to the left of the spine at the level of the tenth dorsal vertebra. The gastric contents pre-

sented a total acidity of 85; free hydrochloric acid, 0.22 per cent.; and blood. The stools showed occult blood.

An *x*-ray examination revealed a marked gastric hypermotility with an irregular area in the duodenum, not coated with bismuth, and which persisted in all the plates ("vacant area").

CASE XII.—January 25, 1913. Duodenal ulcer. J. H. D., male, aged thirty-nine years. The patient was operated on in May, 1912, for cholelithiasis; no gallstones were found, but a chronically inflamed appendix was removed. At this time the suregon noted the presence of a partially healed duodenal ulcer. The patient recovered from the operation, and after three weeks was taken with his present disorder. The symptoms manifested were nausea, fainting attacks, and severe epigastric pains, which lasted for a period of from ten days to two weeks, and would disappear for from one to four weeks, and then recur. The pain appeared two or three hours after meals, and was relieved by food and by the use of soda. On examination an epigastric painful area was revealed. The gastric contents presented a total acidity of 72 and free hydrochloric acid of 62. A retention meal given at night showed the stomach completely empty of food remains the following morning. Occult blood was present in the stools.

An *x*-ray examination showed a long tubular stomach prolapsed, the pyloric end lying well over to the right side. There was a hypermotility of the stomach and duodenum and a vacant area in the duodenum. There were in addition adhesions around the region of the appendix involving the cecum, ascending and transverse colon, and the sigmoid. These produced sluggish motility, but there was no evidence of obstruction.

CASE XIII.—January 2, 1913. Duodenal ulcer. M. S., female, aged sixty-five years. The patient had had indigestion off and on for four years; she was taken acutely ill with what was termed an ulcerated stomach, and vomited a large quantity of blood at that time. The present attack dated back one year. It was characterized by severe pain appearing two hours after eating, accompanied at times by nausea and occasionally by vomiting. Liquids seemed to give less distress than solids. The pain was relieved by the ingestion of food, by the use of alkalies, and by the patient assuming the recumbent position. Eructations were present to a marked degree, and hear-burn was quite frequent. Tarry stools had frequently been observed. On examination an epigastric painful area, exquisitely tender to pressure, was revealed, as well as a dorsal painful area to the left of the spinal column and at the level of the tenth dorsal vertebra. The gastric contents showed a total acidity of 75; free hydrochloric acid, 0.19 per cent.; occult blood was present in the stools.

The *x*-ray examination showed that practically all the abdominal organs were displaced, the position being very abnormal, due to

Pott's disease, which was marked. There was, however, extreme hypermotility of the stomach, so that three-fourths of the contents were emptied in from five to twenty minutes, and in one hour and ten minutes the stomach was completely empty; one portion of the duodenum was rather bulbous, and just behind this bulbous position was an area free of bismuth ("vacant area"). This persisted in several plates, so that there was evidence that we had here an ulcer of the duodenum. The abnormal position of the duodenum and the stomach was entirely due to the Pott's disease and not to adhesions.

CASE XIV.—December 25, 1912. Pyloric ulcer. J. B., male, aged thirty-six years. The patient had had stomach disturbances for four years, with periods of freedom from distress lasting several months. The present attack dated back one month. It was characterized, as all of the former attacks had been, by the following symptoms: intense pain appearing soon after meals; less pain, however, from liquids than solids; the pain disappeared when the patient was in the recumbent position; at times there was nausea and occasionally vomiting, with marked rellef of pain after vomiting. The patient suffered from acid eructations and heart-burn; he had never vomited blood. On examination a marked epigastric painful area was revealed. The gastric secretions showed a total acidity of 88; free hydrochloric acid, 22. On lavage of the stomach in the morning, following a retention meal given at night, the stomach was found completely empty of all food remains. Occult blood was present in the stools.

An *x*-ray examination revealed a cow-horn stomach and a rather bulbous pylorus, the motility of the stomach being good, but the expulsion of the contents was slow. Just above the pylorus a number of plates showed an irregular ragged area, with practically no bismuth adherent "vacant area." This case was clearly one of ulcer at the pylorus.

CASE XV.—January 1, 1913. Gastric ulcer. L. K., male, aged thirty-nine years. The patient had a stomach disorder similar to the present attack a number of years previously. He again complained during the past three months, though he had had periods of relief of short duration. He suffered with severe pain, usually about three hours after meals, though this was not constant, as many times the pain appeared immediately after meals; nausea and vomiting were irregularly present, and pain was relieved after vomiting. There were acid eructations, but alkalies did not relieve the pains. The patient had less distress on liquid food, and was usually relieved when in the recumbent position. On examination a painful epigastric area was revealed, and no peristaltic movements were observed. The gastric contents presented a total acidity of 58; free hydrochloric acid, 38. Food remains and blood were observed in the gastric contents on lavage of the stomach

in the morning, a retention meal having been given the previous night.

An *x*-ray examination revealed a long prolapsed stomach, with a sawed-off pylorus, that is, no evidence of any pylorus could be made out. The pylorus was, however, not completely obstructed, as there was some expulsion of contents, though there was a great deal of retention, with consequent dilatation of the stomach. Contractions of the stomach were quite active, however, showing that the dilatation was not primary, but was evidently secondary to some obstruction of the pylorus. This obstruction was more from within, and was probably due to an old ulcer, with the formation of a great deal of scar tissue and contraction.

On January 16, 1913, the patient was operated on by Dr. J. M. T. Finney. An ulcer was found near the pylorus in the lesser curvature of the stomach; this ulcer was resected and a pyloroplasty performed.

CASE XVI.—January 2, 1913. Gastric ulcer. B. D. C., male, aged thirty years. The patient had been affected with indigestion for five years, with periods of remission. Five years previously he was operated on for appendicitis for symptoms much the same as at the present time. Four years before his symptoms became much more aggravated while training at Muldoon's. The symptoms finally abated after several months. Several attacks followed. The last attack began November 15, 1912, and the patient had seen troubled ever since. He had pain beginning in the epigastrium, and radiating toward the back, following soon after the ingestion of food; more so after solids than after liquids, and was usually relieved by the recumbent position, though at times the pains were severe at night. Eructations were present, which were sometimes acid in character; there was nausea at times, but no vomiting. On examination an epigastric painful area was revealed. There was also a dorsal painful area in the back, to the left of the spine, at the level of the tenth dorsal vertebra. Slight peristaltic movements were visible. The gastric contents presented a total acidity of 72; free hydrochloric acid, 0.19 per cent. There was occult blood in the stools. A small amount of food remains was obtained in the wash water the morning following a retention meal given at night.

An *x*-ray examination showed a large stomach, the pyloric end being drawn well over to the right side, and apparently fixed in that position. The motility of the stomach was quite good, but notwithstanding this, at the end of two hours and a half, a great quantity of bismuth remained in the stomach. It appeared evident that we were dealing with some true pyloric obstruction, as one cannot conceive of the shape of the pylorus and its position due to adhesions causing such complete obstruction, and consequently

must assume that there was some inflammatory condition within the stomach, an ulcer, leading to this abnormality.

CASE XVII.—January 2, 1913. Duodenal ulcer. D. G. K., male, aged fifty-one years. This patient had had an acid dyspepsia for years; he had been troubled with gas and with regurgitation of acid food. In May, 1912, he had some pain in his stomach, which appeared three hours after meals, and which was relieved by food and by the use of soda. On this account he was forced to diet himself, and had to abstain from all indigestible foods. The pain continued and he finally vomited a large quantity of blood. This was soon followed by the passage of tarry stools, An ulcer rest cure was undertaken, and the patient made a speedy recovery.

January 2, 1913. His pains had nearly, though not entirely, disappeared; heart-burn was still present, and there were eructations of acid material. A very slight epigastric tender area still persisted. The gastric secretion showed a total acidity of 72; free hydrochloric acid, 58. Occult blood was present in the stools.

An *x*-ray examination revealed a hypermotility of the stomach, as over three-fourths of the contents were expelled within three-quarters of an hour. In the first portion of the duodenum there was a small constricted area ("vacant spot") and beyond that point a slight bulging. With this condition it was evident that there was some inflammatory lesion of the duodenum in the form of an ulcer.

CASE XVIII.—November 4, 1913. Duodenal ulcer. M. L., male, aged thirty-four years. The patient had had slight digestive disturbance for some time prior to October 23, 1912, on which day he was suddenly taken with a violent attack of pain in the abdomen and was removed to a hospital, the abdomen opened, and a perforating duodenal ulcer was revealed; a rapid life-saving operation was performed, but the ulcer was not excised; three or four weeks later, when the patient was placed on nearly full diet, he was taken with pain, which began two or three hours after meals, and which was relieved by food. The pain has continued to the present time; he has in addition heart-burn, and, at times, acid eructations. On examination an epigastric tender point was revealed, as well as a tender area in the back to the left of the spine, on a level with the twelfth dorsal vertebra. The gastric secretion presented a total acidity of 86; free hydrochloric acid, 0.21 per cent.; the stools contained occult blood.

The *x*-ray examination revealed a long-drawn-out stomach, with the pylorus to the right side, rather bulbous in character, with some obstruction at that region, with excessive hypermotility. These two facts were apparently contradictory, indicating that we were dealing with two conditions: adhesions involving the pylorus from an old operation, and a duodenal ulcer.

CASE XIX.—February 11, 1912. Duodenal ulcer. M. B., male, aged thirty-nine years. The digestive disturbance began in this patient in 1901, when he began to complain of severe pain two to four hours after meals, together with acid eructations, gas, and and frequently of vomiting. The vomited matter consisted mainly of food, and was frequently bloody; the bowels were constipated, and often of a tarry appearance; alkalies relieved his symptoms temporarily, and relief was always afforded by the ingestion of food. Periods of relative comfort alternated with numerous attacks of the kind already described. Five years previously the patient had a sudden and violent attack of pain, and was operated on for a perforating duodenal ulcer; this was followed by a diffuse peritonitis; then double empyema, and four months later obstructive symptoms manifested themselves and a posterior gastro-enterostomy was performed; the ulcer was observed covered over by some scar tissue, and surrounded by many adhesions. The patient was relieved, and was again operated on a little later for an incisional hernia, and the appendix was removed. For several weeks the patient had been suffering with a recurrence of his former symptoms, pain appearing two or three hours after meals, which was relieved by food or by lavage. There were acid eructations, but nausea and vomiting were absent. On examination a slight epigastric painful area was revealed. The gastric secretion presented a total acidity of 71; free hydrochloric acid, 62; occult blood was present in the stools.

An *x*-ray examination revealed the gastro-enterostomy opening free and patent; there were adhesions around the pylorus and duodenum, with increased motility of the duodenum.

CASE XX.—February 27, 1913. Gastric ulcer. M. A., female, aged thirty years. The patient had complained of stomach trouble for fifteen years, with periods of rather severe gastric pain; she suffered with nausea, but only rarely with vomiting. The pain appeared after eating, and was greater with solid than with liquid food, and was relieved when the patient was in the recumbent position. The gastric secretion showed a total acidity of 70; free hydrochloric acid, 0.42 per cent. The examination of the stools presented occult blood. On examination an epigastric painful area was observed.

An *x*-ray examination of the stomach revealed a prolapse. The stomach was of the fish-hook type. There was a delay in the expulsion of the stomach contents, which can be easily accounted for by the prolapse; but, on the other hand, there was aneroded area ("vacant spot"), just at the lesser curvature, within the pylorus, which persisted in all of the plates.

THE PRESENT SITUATION IN SYPHILIS.

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One great discovery has followed another in syphilis in the last ten years in a way that is without parallel in the history of any other disease.

First there was the demonstration by Metchnikoff and Roux in 1903 that syphilis could be produced by inoculation in chimpanzees, which was soon followed by the discovery that other apes, the rabbit, the guinea-pig, and a few other animals were susceptible to inoculation. Quick upon the heels of this basic discovery, which furnished the first opportunity for experimental study of syphilis, came the discoveries that have so greatly increased our exact knowledge of the disease.

In 1905 Schaudinn and Hoffmann ended the long search for the organism of syphilis by the discovery of the Spirochæta pallida.

At almost the same time, in 1905–6, Wassermann, Neisser, and Bruck applied the serum-complement reaction of Bordet and Gengou to the diagnosis of syphilis.

Finally, there has been the development of the arsenical chemotherapy of syphilis, begun by Uhlenhuth, and carried forward so amazingly by Ehrlich by the introduction of salvarsan in 1909.

These fundamental discoveries constitute, of course, an epoch in the history of syphilis, and it is inevitable that they should have produced a complete recasting of the methods of its management. They have in fact revolutionized not only the methods but the principles of its management, and it is to these changes in the practical management of the disease that I would direct brief critical consideration.

The great additions which have been made to the management of syphilis are:

1. Diagnosis by demonstration of the Spirochæta pallida.
2. Diagnosis by the Wassermann reaction.
3. The use of the Wassermann reaction as a criterion of the effect of treatment.
4. Diagnosis by Noguchi's cutaneous reaction.
5. Prophylaxis by inunction of 33 per cent. calomel ointment within a few hours after infection.
6. Treatment by salvarsan and its derivatives.

The Diagnosis of Syphilis by Demonstration of the Spirochæta Pallida. The presence of Spirochætæ pallidæ is the first definite proof of syphilis that can be demonstrated. They are abundant and easily demonstrable at the first appearance of

the initial lesion: before the Wassermann is positive, and before there is any characteristic adenopathy or any eruption. They become less abundant as the chancre ages and somewhat less easy of demonstration, but my experience agrees with that of many others that they can be demonstrated in practically every untreated unhealed chancre. This is not the case if the lesions have been treated, for antiseptic applications, particularly mercurial applications, greatly increase the difficulty of or prevent their demonstration.

As everyone is agreed on the importance of as early a diagnosis of syphilis as possible the serious question at once arises, How distinctive are the characteristics of the Sp. pallida, and how much reliance can be placed upon the diagnosis of syphilis solely upon its demonstration? Certain spirochetes resemble more or less closely the Sp. pallida, Sp. refringens, and Sp. balanitidis found in chancres and mucous patches; Sp. buccalis and Sp. dentium in the mouth; Sp. pseudopallida in cancerous ulcers, and the Sp. pertenuis of yaws. The spirochetes most resembling Sp. pallida are Sp. dentium in carious teeth, Sp. pseudopallida, and Sp. pertenuis.

Most workers of experience believe that the Sp. pallida can be definitely distinguished from these organisms, and with that my experience agrees. But it must be emphasized that a reliable recognition of the Sp. pallida under dark field illumination or in stained specimens requires a practised careful observer who is habitually doing this particular work. Under these conditions the diagnosis of syphilis by the demonstration of Sp. pallidæ can, I believe, be reliably established. In so important a situation as the determination of syphilis in the first days of a chancre, from the recognition of Sp. pallidæ alone, I believe it is desirable to determine the character of the spirochetes by two independent observers, in order, so far as possible, to eliminate the personal equation. This I have done in numerous instances, and I have not had disagreement in the decisions.

I do not know of the unreliable work in the diagnosis of syphilis from the spirochetes as I do from the Wassermann reaction—due, I believe, to the fact that the demonstration of the organism is not commonly relied upon for diagnosis—but this is a method of diagnosis easily open to error and abuse. I do not believe the ordinary laboratory man who is not familiar by constant observation with the various spirochetes can be safely relied upon to differentiate the Sp. pallida in critical situations. The demonstration of spirochetes under dark field illumination is one of the simplest laboratory procedures, but the reliable differentiation of the Sp. pallida is not simply a matter of laboratory technique.

The demonstration of Sp. pallidæ in secondary lesions when other evidence of syphilis exists is a less critical matter. Here

the demonstration is only confirmatory evidence, and it has the value of one fact in establishing the diagnosis. Occasionally this is an important fact in determining the character of confusing lesions, particularly on mucous surfaces or at mucocutaneous junctures, occurring in the course of active syphilis.

Unfortunately for diagnostic purposes the spirochetes are so few and so difficult to demonstrate in late (gummatous) lesions that their demonstration is not a practical method for establishing the character of these lesions.

THE WASSERMANN REACTION IN DIAGNOSIS. On the question of the specificity and reliability of the Wassermann reaction there is no need to waste space. The world is agreed in the affirmative upon these points. With the exception of a few now well-recognized conditions, which fortunately are not likely to lead often to confusion with syphilis, the Wassermann reaction is specific for syphilis, and can be elicited in most cases in which the disease is present. It becomes positive only when the disease has become generalized; the reaction is present, therefore, only in about 40 per cent. of cases at the appearance of the initial lesion. During the three weeks after the appearance of the initial lesion it becomes positive in about 75 per cent. of the cases, and when the cutaneous manifestations of the disease become well established, it is positive in practically all untreated cases. In late syphilis the reaction is positive in about 80 per cent. of cases. In latent cases it is positive in about 50 per cent.

In spite of the remarkable trustworthiness of the Wassermann, syphilographers generally, I believe, are conscious of many serious mistakes which are occurring in the practical application of it in diagnosis. These mistakes arrange themselves in three groups:

1. The diagnosis of syphilis from supposedly positive Wassermann's in the absence of syphilis.

2. The failure to recognize syphilis because of a negative Wassermann.

3. The reliance upon the Wassermann in conditions in which the presence or absence of syphilis has no practical bearing upon the lesion under consideration.

1. A positive finding in the absence of syphilis, of course, should not occur with a trustworthy reaction. The fact remains, however, that the mistake of reporting a positive Wassermann, when actually it does not exist and in the absence of syphilis, does occur, and, I believe, not infrequently. I have had this occur more than once in my experience in cases in which the lesions under consideration were not syphilitic, and in which Wassermann's made in my laboratory and, as a control, independently by another reliable worker, were negative.

How can such mistakes occur? Simply from the fact that the Wassermann reaction—absolutely trustworthy in itself, when posi-

tive, if correctly made and correctly interpreted—is done by human hands, and human hands are fallible. Let a laboratory man speak upon this point: "One need not emphasize the fact that in the laboratory there are no infallible methods, a fact which is most glaringly true of the Wassermann reaction. I make this statement taking for granted that the worker is experienced" (Kaplan); and then he recites for illustration a case in which from one serum three reports were obtained: a positive from a tyro; no decision from the second; negative from the third. Again: "In the Wassermann reaction the stumbling blocks are many and can be overcome by experience and practice only. The beginner makes many non-luetic sera positive, the theoretical worker does the same to a lesser extent, and the mature worker fails to report many syphilitic sera as positive."

The Wassermann reaction has many factors in it to give rise to error, and a reliable Wassermann, therefore, requires experience, careful attention to technique and to controls, and care in interpretation of results. With such requirements it is not surprising that errors occur with careless or immature workers. This is true of the original Wassermann; it is much more true, as nearly all workers are agreed, if the simplified modifications of the Wassermann are used.

2. Inaccurate work may be responsible for some negative Wassermanns in the presence of syphilitic lesions, but this mistake of reporting the Wassermann negative when it is actually positive has not been brought to my attention in the way the grosser opposite error has.

Without error in the reaction a negative Wassermann is not rare in late (tertiary) active syphilis; it occurs in 20 to 30 per cent. of the cases. Even in cases of treated active secondary syphilis one sometimes gets a negative Wassermann. It follows therefore that to rely on the Wassermann alone to make a diagnosis of syphilis is to court trouble, and this is the mistake that is constantly being made. It is not a rare experience to see a frank syphilide in the skin left unrecognized and untreated, as far as efficient treatment is concerned, because the Wassermann is negative. And if this occurs with cutaneous lesions of syphilis it surely occurs with internal lesions.

3. The third error, relying on the Wassermann in conditions which have nothing to do with syphilis, we in dermatology occasionally see. In epithelioma, especially epithelioma of the tongue, in lupus, in sycosis, in chronic eczemas of the hands, in various sorts of generalized eruptions, which surely had nothing to do with syphilis—scabies, for example—it has been my experience to see much useless puttering over Wassermanns, and in some cases, which happened actually to have syphilis, much mental perturbation because non-syphilitic lesions had not yielded to syphilitic

treatment. The syphilitic, of course, is not immune to other dermatoses; he is actually predisposed to some non-syphilitic lesions, as epithelioma of the tongue; and when one goes to giving weight to the Wassermann in non-syphilitic dermatoses in syphilitic subjects he is soon hopelessly confused.

The deduction to be made from these errors is that we should not neglect other forms of evidence. That unfortunately is the tendency whenever any laboratory test becomes available in diagnosis. I suspect there are few men, with the exception of thoroughly mature laboratory men themselves, who have not a little superstitious super-regard for laboratory findings as compared with clinical observations, when as a real fact they are more open to error and more in need of the qualities of experience and maturity of judgment than are clinical observations.

Nothing is surely more true than that the Wassermann in diagnosis must constantly be checked and compared with the clinical findings. If these are neglected, reliance upon the Wassermann must inevitably involve one in serious mistakes. As a matter of fact the lesions of syphilis upon the surface and at the orifices of the body are, as a rule, perfectly characteristic regardless of the Wassermann; and if these characteristics are neglected or not known the observer who depends upon the Wassermann will overlook one case in every five of them.

In considering the pitfalls of the Wassermann as it is practically applied no suspicion arises as to the real value of that reaction. Carried out with skill and care, and interpreted with appreciation of its limitations, a vast accumulation of experience has demonstrated it to be a perfectly trustworthy test. But it is only one fact, and its value is nearly always as confirmatory evidence of syphilis, of which there is usually abundant clinical evidence also to be found if sought with reasonable intelligence and care. It is the rarest experience to have nothing to indicate syphilis except the Wassermann, and when one hangs a diagnosis of syphilis on that evidence alone he should remember his diagnosis hangs upon a single thread of whose strength he should be perfectly certain. And even when he is certain of his positive Wassermann, if he does not know or consider his clinical conditions, the patient's trouble may still be a pus infection, or tuberculosis, or the itch, or some other non-luetic disease. The Wassermann is not a satisfactory substitute for clinical knowledge.

The Wassermann as an Index of Treatment. Following the great authority of Neisser, the Wassermann is being widely used as an index of the efficacy and of the necessity for treatment. Neisser's position is this: A positive Wassermann is proof of active syphilis and of the presence of living spirochetes; therefore, a positive Wassermann is an indication for specific treatment. As a corollary of this the efficacy of treatment may be judged

by the effect upon the Wassermann. "Conversely a negative reaction, which means the restoration of the serum to its normal state, signifies generally if not complete destruction of the parasites at least the establishment of a condition of equilibrium between the host and the spirochetes, so that the latter assume the character of harmless saprophytes. If any treatment short of complete sterilization is to be of value it must maintain this relationship; hence the Wassermann reaction should be used to control the treatment, as it is usually the most subtle indicator of a disturbance of equilibrium with a tendency to the assumption of pathogenic activity on the part of the spirochetes." This quotation from Browning and McKenzie states well the position of those who make the Wassermann the basis for the so-called "biologic" treatment of syphilis.

It is not established beyond any possible doubt that a positive Wassermann means active syphilis. This is, however, probably true. All that can with scientific accuracy be said of a positive Wassermann is that it is evidence that the patient has had syphilis —the rest is, in part at least, assumption.

Conversely it is not established that a negative Wassermann means "the establishment of a condition of equilibrium between the host and the spirochetes, so that the latter assume the character of harmless saprophytes." On the contrary, clinical evidence proves beyond doubt that at times with a negative Wassermann the spirochetes may possess their usual virulence. All experience has shown that in 20 per cent. to 30 per cent. of cases of late active syphilis the spirochetes are showing every evidence of pathogenic activity in spite of negative Wassermann. One may even see, as I have seen, mucous patches teeming with Sp. pallidæ in late secondary syphilis with the Wassermann negative. So it is not true beyond any possible question that a positive Wassermann means active syphilis, and it is certainly not true that a negative Wassermann means a condition of equilibrium between the spirochetes and the tissues, so that the spirochetes have become harmless saprophytes.

It can be said, however, that the Wassermann reaction in syphilis is not a true specific antibody-antigen reaction. It is established that a specific syphilitic antigen is not necessary to the reaction, and a consideration of all the facts indicates that it is highly probable that the substance in the syphilitic serum that produces the specific Wassermann reaction is not true syphilitic antibody but some undetermined substance. This latter fact is exceedingly important in its practical bearing upon the question of the value of the Wassermann reaction as an index of treatment. For if it were true that the Wassermann reaction is an index of the amount of antibodies produced—in other words, of the immunity which the individual is building up to protect himself—one might well

hesitate at using as an index of the efficacy of treatment what was really the index of the individual's acquired resistance to the disease. The subsidence of the Wassermann at the same time with the improvement in the condition of the syphilitic patient is one of the best evidences that it is independent of antibody and that it is a reliable index of the efficacy of treatment.

So far we are upon reasonably safe ground: the subsidence and disappearance of a positive Wassermann is an evidence of improvement in the condition of a syphilitic, and as such is an evidence in favor of the efficacy of the treatment which he is undergoing. But it is only one piece of evidence; it is not conclusive and compelling evidence that all is well; its value may be completely offset by the persistence of hyperplastic glands, by the persistence of cachexia, or, as at times may happen, the Wassermann-unheralded appearance of mucous patches or a late secondary eruption or a gumma. Its proper value then is as one symptom. It is, however, one symptom of great practical importance because it may be elicited when all others have disappeared. But as an index of the condition of a syphilitic patient or of the effect of treatment it is not entitled to preponderating consideration. It is desirable to see it disappear, as it is any other symptom of syphilis; but it is also desirable that adenopathy should subside, that mucous and cutaneous and systemic symptoms should disappear, that weight should be maintained, and that the patient's feeling of well-being should be high. If some of these evidences of the disease persist or recur we are in no position to say that the patient is better off than he would be with a persistent or recurrent positive Wassermann.

To repeat then, a negative Wassermann is an evidence of the betterment of syphilis, but it is only one form of evidence, and in weighing its importance as an index of the efficacy of treatment it is entitled to weight only in its relation to all the facts in the case.

The fact that the Wassermann is not all-important is no reason why it should not be taken at frequent intervals during treatment and given reasonable weight. And there is good reason to believe that the sooner it becomes negative and the more constantly and longer it remains negative the better is the prospect of the case, as it is with a similar course of all other symptoms of syphilis.

How long must the Wassermann remain negative before we may proclaim a patient cured? We are in no position to answer that question by any positive statement. There is now a very strong pretension that undertakes to claim a cure of syphilis after the Wassermann has remained persistently negative for a certain length of time. There is some justification for this in the abortive treatment of syphilis, when, after the chancre, neither a positive Wassermann nor any other evidence of syphilis appears. Omitting,

however, these cases the clinical history of syphilis compels us to believe that we cannot give a positive assurance that the disease has gone never to return. We can give assurance after several years of a negative Wassermann, of probable immunity, as we can after several years of symptomatic freedom.

How long then shall the Wassermann be taken? If one is to be logical, as long as one's clinical judgment indicates that the syphilitic should be watched; and in my opinion that means at intervals for life. Bayly, himself a pathologist, considering the question from the theoretical standpoint, gives under what seems from the phrasing of the last half of the sentence to be logical compulsion a good answer to this question: "A single negative reaction obtained with a serum of a patient undergoing treatment by mercury or salvarsan means little but that the patient is reacting to such treatment. A series of negative results taken at intervals of three or six months after all treatment has been given up is necessary before the patient can be regarded as cured [here he seems to lose heart—W. A. P.], and even then, until twenty years have passed, we cannot be absolutely certain that the disease is completely and permanently obliterated." In other words, we are no more in position now than we have been in the past to ignore the possibility of future relapses in our luetic cases.

Space permits of only a brief consideration of the luetin reaction and the prophylaxis of syphilis by inunctions of calomel ointment, but no review of the newer syphilis can fail to mention them.

The Luetin Reaction. Noguchi, using a suspension of killed Sp. pallidæ, which he calls luetin, has developed a cutaneous test in syphilis analogous to the tuberculin test. It depends upon the fact that in the presence of syphilis a reaction, showing as an inflammatory nodule, appears after the injection into the skin of a drop of diluted luetin in syphilitics who are in a condition of allergy to syphilis. My experience in about two hundred cases tested with Noguchi's luetin, like that of a number of others who have used it, is that it is a valuable addition to our means of diagnosis. It has the essential quality of specificity. The reaction does not occur in other conditions than syphilis, so that with proper care in technique and interpretation it is a reliable evidence of syphilis. It can rarely be elicited in early syphilis, but in late syphilis the reaction is positive in 50 per cent. or more of the cases. And, fortunately, the reaction frequently develops in late syphilis with a negative Wassermann, so that it is a valuable supplement to the Wassermann test.

All considerations indicate that the test is a specific allergic phenomenon due to sensitization of the tissues to the virus of syphilis. The evidence for its being an indication of active syphilis is of the same character as that for the Wassermann, and as a diagnostic test and as a guide to treatment the same considerations

apply to it that apply to the Wassermann. There seems good ground for believing that the luetin test will prove a useful supplement to the Wassermann in both of these functions.

The Prophylaxis of Syphilis with Calomel Ointment. Metchnikoff and Roux announced in 1906 that syphilis can be prevented with reasonable certainty by prompt inunction of the infected point with 33 per cent. calomel ointment. Their experiments were of such great practical importance that it is surprising the subject has not created wider interest. In substance their findings are: The inunction should be made within eighteen hours at the latest; at twenty hours it fails. The ointment should be rubbed in for a few minutes; in their most critical experiment it was rubbed in for five minutes. Calomel in the proportion of one part to two of ointment is effective.

Their experiments were carried out with scientific accuracy and the strictest care for control, and the results are entitled to respect. Very extensive attempts at the prevention of syphilis based on this method have been undertaken in the United States Army and Navy, and the experience is strongly confirmatory of the value of the method. As it would appear now this very simple prophylactic procedure is one of the most important measures for the control of syphilis that has been suggested. The ointment used by Metchnikoff and Roux in their original experiments was $33\frac{1}{3}$ per cent. calomel and $66\frac{2}{3}$ per cent. lanoline. The ointment which they recommended is calomel 33, lanoline 67, vaseline 10. This base is stiff and it deterioates. There is no evident reason why any of the ointment bases may not be used as well, particularly benzoinated lard. The inunction should be made soon after suspected infection—within eight hours if possible; the ointment should be rubbed on to the area of suspected infection for five minutes and the surplus left on the surface.

Of course, Metchnikoff and Roux's effort was not the first attempt to prevent syphilitic infection by the use of a mercurial application. The importance of the work lies in the accurate demonstration of the effectiveness of a simple practical method of prophylaxis.

Salvarsan in the Treatment of Syphilis. The man who has to do with the treatment of syphilis has never had a greater responsibility put upon him than exists in the question of the use of salvarsan in the treatment of his cases of syphilis. The claims for it have been so strong and the sponsors for it of such high authority that it has been no easy task to exercise restraint in giving one's patients the supposed benefits of it; and yet, there are many considerations which make one hesitate at its administration in the heroic way which has been advocated and which raise serious questions concerning the sum total of its usefulness. Although the time that it has been in use is short, compared with that necessary to get any final knowledge of the ultimate value of any means of

treatment in a disease so tricky as is syphilis, we are already acquiring a fund of knowledge of salvarsan that enables us more satisfactorily to determine its place in the treatment of that disease.

The questions which confront us now in considering salvarsan indicate a different situation from that which we thought we were in when salvarsan was introduced and we had the hope that in it we had an effective remedy for the cure of syphilis. Now the questions are how effective is salvarsan in syphilis? How far can it be substituted for the older means of treatment, and what are the objections to its use? It is no longer *therapia sterilizans magna*, to use one of the striking terms we learned from Ehrlich.

At present the subject of salvarsan in syphilis can be considered from two standpoints: its value as a symptomatic remedy, and its value as a curative agent. In addition we must consider its disadvantages. The disadvantages of it may be taken up first, for they have some bearing upon all considerations of its therapeutic use.

Disadvantages of Salvarsan. Salvarsan has proved less toxic than the organic arsenic compounds of which it is the successor, but it must be at once said that it has not been found the safe remedy that it was hoped to be. It has not proved to be wholly parasitotropic and free from dangerous organotropic and neurotropic qualities, to use more of the terms for which we are indebted to Ehrlich. On the contrary it has shown again that arsenic is still treacherous, and that, combine it as we may, it is when used in quantity still dangerous. The minor disturbances from its use—fever, nausea, vomiting, diarrhea, prostration, headache, low blood pressure, temporary cardiac disturbances, transitory albuminuria and the like—may be dismissed with brief courtesy. Some of them are important as suggesting contraindications to the drug, but they are of no practical importance in so serious a problem as the cure of syphilis.

The serious accidents are in a different category. They show that salvarsan may cause death or great permanent damage of important structures. In comparison with the innumerable injections of salvarsan which have been given the deaths from it have been few, but it is true that the literature gives no adequate representation of the deaths which directly or indirectly have been due to it. And many of these deaths occur in the early stage of syphilis—the stage in which death from syphilis itself is excessively rare—and in patients who were vigorous and otherwise healthy; so that the possibility of this occurrence must be weighed in using the drug, especially in the free manner required in attempts at radical cure of the disease. Some of these deaths have been arsenical deaths, with the symptoms of arsenical poisoning, but more of them have probably been due to indirect, and in many cases not well understood, effects of salvarsan on luetic lesions in structures of vital importance. On this latter point—that the deaths are

not directly due to salvarsan poisoning—much emphasis has been laid by salvarsan enthusiasts, although it would not seem a matter of great practical importance whether death is due directly to a drug or to some indirect result of the drug so long as a fatal result ensues. These salvarsan deaths make it particularly important, when vigorous use is to be made of the drug, that its contraindications be borne in mind—a fact which Ehrlich has emphasized from the start.

Of the untoward effects, those upon the nervous system are of the greatest interest and importance. They go through the whole range from the simplest to the gravest nervous disturbances—herpes, herpes zoster, multiple neuritis, paralysis, especially of cranial nerves, disturbances of memory or of orientation, epileptiform attacks. Salvarsan has not shown the affinity for the optic nerve that was such an obstacle to the use of its predecessors, notably atoxyl. Nevertheless, partial or complete optic atrophy from it has occurred numerous times. The acoustic nerve has shown greater susceptibility than the optic and involvement of it is not excessively rare. In some cases great damage both to sight and hearing has been produced. Perhaps the most extreme form of nervous involvement has been fatal cases of hemorrhagic encephalitis, of which several have occurred. Most of the nervous accidents referred to above are, there seems every reason to believe, directly due to the drug, and they show that salvarsan has the old dangerous affinity of arsenic for nerve tissue. As Busse says, these fatalities are due to the treacherous action of arsenic and the dangers are inherent in the new preparations of arsenic just as in the old; the physician must reckon with the possibility of them whenever he uses large doses of any of them.

And this raises one of the most serious questions in regard to salvarsan. Probably the greatest, and certainly the most wretched, uncontrollable dangers of syphilis are the parasyphilitic nervous affections. The nervous system bears the brunt of the untoward effects of salvarsan upon the organism. How is this to affect the parasyphilitic nervous affections? The question would be less serious if salvarsan were quickly excreted and its action on the tissues soon over. It was at first thought that this was true when salvarsan is given intravenously, but the researches of Buschke and his assistants have shown that arsenic can be recovered from the urine and blood for weeks and months, "yes, even for a year," after intravenous injection of salvarsan. And the clinical findings confirm this, for the nerve lesions of the type we are now considering may appear any time from a few days to months after the administrations of the drug.

These patients then are exposed to the danger of long-continued arsenical intoxication, and that this produces degenerative nerve changes the Manchester epidemic of chronic arsenical poisoning as

well as innumerable separate experiences have shown. We have an unpleasant analogy in the effect of alcohol—another drug affecting the nervous tissues—whose persistent use is generally accepted as a predisposing cause of paresis and tabes. We are then in no position to say that this effect of salvarsan on the nervous system may not render it more susceptible to the degenerative disturbances which follow syphilis itself. Professor Buschke, of Berlin, wrote in 1912, "The theory that the intensive treatment with so neurotropic a drug, which remains so long deposited, can favor the occurrence of tabes and paresis cannot lightly be cast aside." And Professor Brocq, of Paris, wrote in January, 1913: "I do not know what it will do for the remote contingencies which we are discussing (parasyphilitic diseases, W. A. P.). We are at liberty to hope for the best, but I must admit that I am the prey of grave doubts." Only long experience can settle this important question.

The other class of nervous accidents following salvarsan are not assignable directly to its toxic effects, but occur through its effect on syphilitic lesions. These accidents may result from the sudden solution through the action of salvarsan of luetic lesions in important structures—a process that probably represents the extreme degree of the Herxheimer reaction. Others of them correspond to the usual form of Herxheimer reaction, that is, the temporary stimulation of luetic infiltrations by the drug, with the production of congestion and edema. If this occurs in meningeal lesions it may cause great temporary increase of intracranial pressure, or if in a cerebral endarteritis it may result in occlusion of the vessels. It is this reaction of active specific lesions to salvarsan—which is explained as due to the sudden liberation of supposed endotoxins—that accounts for most of the comas from salvarsan administered during the secondary period, when mild syphilitic meningeal irritation is likely to exist, and which compels caution in the use of salvarsan in the presence of syphilitic cerebral lesions.

The other form of nervous accidents following salvarsan are true syphilitic lesions in nervous tissues—the "neurorecidives" of Ehrlich, nervous lesions of syphilis, with which we were familiar before the advent of salvarsan. It was vigorously maintained until recently that these nerve involvements were not more frequent after salvarsan than before it came into use. And to support this contention the whole previous study of syphilis was indicted and charged with simply having overlooked them. Now it is admitted that they are more frequent, and this fact is taken into consideration in every scheme of salvarsan therapy. It is one of the facts which have compelled the simultaneous use of mercury. These neurorecurrences will be reverted to in considering recurrences in general.

One can, by dwelling on its dangers, exaggerate the untoward effects of salvarsan. They are relatively infrequent and, because of their infrequency, relatively unimportant in comparison with the great gain of curing syphilis if we have any reasonable assurance of attaining that end by salvarsan.

Symptomatic Action of Salvarsan. There can be no two opinions as to the specific action of salvarsan upon the active lesions of syphilis. It is a powerful symptomatic remedy. In rapidity of action it surpasses mercury or mercury and iodides in many lesions; in others, it equals or is inferior to these older remedies. In early syphilis it has a quick effect upon the initial lesion, mucous patches, and condylomas. Its action is quick upon mucous-membrane lesions generally. Its effect upon the cutaneous eruptions is not more prompt and not more complete than that of mercury. Upon the severe forms of early syphilides —large pustular eruptions, early gummatous lesions—its action is often strikingly effective. According to wide experience the effect upon the adenopathy of syphilis is surprisingly slight. Upon late gummatous lesions of the skin—apparently less upon gummas of the internal organs and upon bone lesions—the action of salvarsan is usually prompt and effective. It is in extensive and intractable lesions of this sort that it has probably its greatest field of usefulness as a symptomatic remedy; and it is the more promising here because, for the healing of such lesions, moderate doses are sufficient and the use of heroic quantities of the drug are not necessary, as in the attempts at radical cure with it. In the rare cases of severe early or late syphilis, which are not amenable to established methods of treatment, it undoubtedly is an effective addition to our means of treatment.

Aside from these latter and rare cases there is need to emphasize that salvarsan, as a rule, does nothing in gummatous lesions of syphilis that cannot be done effectively with mercury and the iodides—perhaps done slightly slower, but almost without any of the toxic dangers of salvarsan. For there is a tendency now to forget the value of the older means of treatment of these lesions. And so we constantly see reference to cases "hopeless by mercurial treatment," "intractable to mercury and iodides" or "malignant." As a matter of fact such cases, in which actual lesions of syphilis, not parasyphilis, are uncontrollable by mercury and the iodides and rational measures are excessive rarities. The treatment of such lesions by mercury and the iodides is, as a rule, one of the most definite feats of therapeutics.

As to the effect of salvarsan upon the Wassermann, evidence is conflicting. Experience in general is that except in the early primary stage it is not more effective in reversing a positive Wassermann than is mercury; in moderate doses it is less effective than safe vigorous mercurial treatment.

Curative Use of Salvarsan. What of salvarsan as a cure for syphilis—the high result that was hoped for when it was introduced? How far has it realized this hope?

In the primary stage, at the appearance of the chancre, the evidence is strong to lead us to hope that with salvarsan much more can be done than has ever been done before to abort syphilis: That is, when the syphilitic patient is seen before the disease has become generalized, while the spirochetal infection is localized around the initial lesion and before the Wassermann has become positive, it is possible in many cases to prevent the development of secondaries and hold the Wassermann negative by immediately instituting and vigorously carrying through a course of salvarsan and mercury treatment. The period of observation of these cases is still short, and success in preventing all early indications of syphilis is not conclusive proof that the patients are free from syphilis; but it is more than we can do with mercury, and it is strong presumptive evidence that the disease has been aborted.

This abortive action of salvarsan in the primary period gives it a very valuable field of usefulness. As already indicated, about 40 per cent. of cases of initial lesion, which can be distinguished by the demonstration of the Sp. pallida, show a negative Wassermann for one or two weeks after the lesion's appearance. In these cases there is a reasonable prospect that syphilis can be aborted—a prospect that justifies a vigorous attempt with salvarsan. This of course makes the early diagnosis of the initial lesion a matter of great importance.

After this brief stage of promise has passed the prospect of cure rapidly changes. It becomes less promising from week to week, and after secondaries are well established it almost or quite vanishes. That sad conclusion has been forced upon us by the accumulated evidence of recurrences in cases treated in the secondary stage. It has gradually forced the salvarsan advocates from the use of a single massive dose to courses of many repeated doses in combination with the most vigorous mercurial treatment. There the method now rests. In the opinion of salvarsan advocates some early cases can be cured by vigorous treatment. But even they admit that if cure is to be attained it is only by heroic courses of salvarsan—2 to 4 grams of salvarsan in a few weeks—combined with vigorous intramuscular use of mercury. If less than this heroic attempt at cure is made the opinion, even of some salvarsan advocates, is coming around to the view that the drug had better not be used at all. Some have gone even farther and do not use it for curative purposes after the Wassermann has become positive.

This position I believe is one which we are forced to by the logic of experience. And this position, quite aside from any hesitation about using the drug on account of its dangers, depends upon one fact—the increased frequency of severe syphilitic relapses, chiefly

nervous, after the use of salvarsan. That there is an increased frequency of relapses of syphilis in the form of nervous lesions is now accepted. This is true as well, I believe, of relapses of gummatous lesions in the skin and elsewhere, but attention has been centred upon the nervous lesions because of their seriousness. Attention was early called to the frequency of nervous lesions after salvarsan by Finger, Rille, and others. The fact was bitterly denied by Ehrlich and his school, Benario, with industrious loyalty, going so far as to compile in a book the cases of nerve syphilis in the literature of presalvarsan days in order to show that their frequency is not now greater than formerly. But from that position they have been compelled to recede, and now the increased frequency of "neurorecidives" is admitted even by salvarsan enthusiasts. Thus Nichols and Hough, Nichols being one of the earliest and still one of the most enthusiastic salvarsan advocates, say: "The question still remains why these relapses are more frequent under treatment with salvarsan than with mercury."

Much difference of opinion has existed as to the reason for these relapses, some attributing them to the direct effect of the arsenic on nervous tissue, Ehrlich's school vigorously maintaining that they are lesions of syphilis. There is little doubt now that the latter view is correct, and in the reason therefore lies the strongest indictment to be made against salvarsan.

To complete the quotation from Nichols and Hough: "Some authors hold that salvarsan damages the nervous system and thus predisposes to a localization of the spirochetes in this region. It seems to us, however, that these relapses can be satisfactorily explained according to Ehrlich's ideas. In a considerable number of cases in the secondary stage the nervous system is infected with or without symptoms. . . . When such a case is treated with salvarsan the great bulk of spirochetes are suddenly destroyed. They are not simply repressed, as is the case under mercury, and the resistance of the body is not gradually stimulated against them. There remain, however, small foci of spirochetes, especially in areas which are less accessible to the circulation, such as are found in the central nervous system. After a time these spirochetes begin to multiply, and they meet no resistance such as is afforded by the continuous administration of mercury or by the natural defences of the body, because these defences have not been continuously stimulated by a large number of organisms all over the body. As a result the spirochetes which have remained grow with increased vigor and presently produce symptoms where they are located, in the nervous system." And as we would expect if this last phrase were stated in the full form logically demanded by the "increased vigor," the spirochetes, growing without the opposition of the usual resistance developed by the infected organism, cause new lesions of severer type than is usual in early syphilis.

Stated in another form this proposition is as follows: Salvarsan destroys the spirochetes except those walled off in inaccessible localities; therefore, the body is not stimulated by a general infection to the production of those antisubstances which are its natural defence, and so builds up little or no resistance. Later these isolated foci of spirochetes grow, and because of lack of acquired resistance to them grow with increased vigor, and so produce damaging lesions. Finally their growth spreads beyond the isolated focus or foci and, as after the chancre, infection becomes general, while at the same time no natural defence has been built up. In other words, the patient who is treated vigorously with salvarsan but short of absolute destruction of all the spirochetes has his day of reckoning briefly postponed, but at the price of having to meet it later under adverse conditions.

This is why the view is gaining ground that if the prospects are not good of cure from salvarsan, or if it is not to be given in the vigorous way necessary to have a chance of cure, it had better not be used at all in the early period of syphilis when the patient is building up his natural resistance.

This reasoning of course does not apply against its use as a symptomatic remedy for the treatment of the later lesions, long after the patient's specific immunity has been stimulated and utilized.

To RECAPITULATE: 1. Salvarsan has real dangers; they are remote, but, when they occur, serious.

2. As far as can be deducted from our present knowledge there is no reason to believe that salvarsan will lessen the occurrence of parasyphilitic nervous affections, and some ground for fear that it may predispose to them, except in those cases in which it cures the disease.

3. It is a powerful symptomatic remedy.

4. In cases in which vigorous treatment is begun before the generalization of the disease there is strong ground for believing that syphilis can be aborted. This possibly applies to a few early cases with secondaries.

5. In all other cases in the secondary period its "curative" use may do more harm than good.

"Whatever be the power of the new arms which have lately been placed at our disposal for the treatment of pox, the practitioner must clearly understand that the antique rules of therapeusis have not undergone any change. He must grasp the idea that his duty is first and foremost to place the organism in the best possible state to resist and thus minimize the virulence of the infection; that by a well-ordained hygiene he may reduce to a minimum the secondary manifestations and the tertiary liabilities." (Brocq.)

THE HEART IN SYPHILIS.[1]

By Harlow Brooks, M.D.,

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About one year ago I reported before the Society of the Alumni of the City Hospital a systematic anatomic study of the heart and aorta from fifty consecutive autopsies in cases of syphilis. I was stimulated to this investigation by the frequency with which I had observed serious and often fatal circulatory symptoms in cases of lues, many in patients who had been well treated and who not infrequently had long before ceased to manifest any signs or symptoms directly attributable to syphilis.

This study led me to believe that luetic involvement of the heart and aorta is much more frequent and much more serious in its direct effects than has been generally conceded by internists or even by syphilographers. In many text-books and monographs on this now newly understood infection, syphilis of the heart is not uncommonly mentioned as among the more unusual complications of the disease; yet in my postmortem series I find that 66 per cent. of my luetic cases, including well and incompletely treated instances, die as a result of or with serious circulatory disease apparently of specific origin. On analysis I find that in many reports this apparent infrequency of cardiac involvement is probably based on the relative rarity with which one finds true gumma in the heart at necropsy. In the other viscera the liver, the kidney, or brain, we also count as luetic the scleroses, fibroses, and degenerative changes which follow the more active syphilitic lesions.

Applying this same general basis for syphilitic cardiac lesions in my anatomic study of 50 cases, I found the following relative occurrence of definitely specific changes. The epicardium or visceral pericardium was diseased in 28 of the 50 instances. In regard to this membrane I call particular attention to a somewhat characteristic lesion manifested grossly by the appearance of opalescent patches of thickening which correspond to the perforation points of terminal arterioles. These opacities are formed of a mingled fibrous and endothelial hyperplasia which apparently occurs chiefly about the terminal arterioles. This lesion is not confined to lues but is much more frequent in it than in any other one condition which I have yet observed, and I have compared its genesis to that of syphilitic leukoplakia so frequently seen, especially in the buccal mucosa.

The myocardium was found diseased to a serious degree in 44

[1] Read before the Internal Section of the Buffalo Academy of Medicine, December 10, 1912.

of the 50 cases, and true cardiac gumma was present in 5 instances, a percentage of occurrence closely approximating that given by Marcek. The most frequent myocardial change was found to be an inflammatory process manifested in the greater number of my cases, which were chiefly of late stage syphilis, by small round-celled infiltrations about the arterioles or by foci of fibrosis which I believe to be results of the inflammatory or infiltration process shown in the first-mentioned lesions. As a probable sequence of such changes, cardiac aneurysm was found present in 3 instances. Diffused or localized areas of scar formation were frequently encountered, but fibrosis was usually associated with other changes, often degenerative in character. Acute purely degenerative lesions were absent except in certain examples where they had apparently resulted from concomitant or independent disease.

In 35 instances disease of the coronary arteries was present to a relatively greater grade than the general arterial changes. This specific affinity to attack the coronary vessels has long been recognized, and in certain of my group of cases it was shown to have become an important factor even before the secondary rash had fully declared itself. The occurrence as well as the degree of coronary disease appears to correspond more or less with the activity rather than to depend on the duration of the infection. In this regard also it is interesting to note that age apparently plays little if any role in the determination of coronary disease in lues. Five of my most striking cases were below thirty years of age and 4 others below forty.

The type of the coronary change is variable. In 3 instances coronary thrombosis had resulted from an active primary endarteritis, but the most frequent change appears to be a fatty degeneration with endarteritis. From the diseased vessels there spreads out into the muscle all manner of changes, from a granulomatous and true myocarditis to fibrosis or necrosis, the result of deficient nourishment. In 2 examples of my autopsy series, aneurysm of the aortic arch was found present within six months after the primary lesion.

The natural questions which occur to a clinician after finding changes of this kind so prevalent are: When do they occur? Do they produce symptoms and signs which are clinically recognizable? May these lesions be prevented? May they be cured?

During the past two years my clinical studies have been largely directed toward an attempt to answer for myself these queries. Partly through the courtesy of my colleagues I have been able to carefully study in my own services a large group of cases of tertiary syphilis which directly applied to this subject and through the generosity of my colleague, Dr. J. A. Fordyce, of the syphilis service at the City Hospital, I have also been enabled to observe

numerous cases of primary and secondary lues both before and after treatment.

It is manifestly impossible to go into accurate statistical or analytic details in so generalized a paper as this, but I hope to cover the ground of our studies in a sufficiently comprehensive manner to give a general idea of the conclusions which we have thus far reached. My associate, Dr. Carroll, and myself hope to publish later in considerable detail the various phases of the subject as they have appeared to us after a still wider and longer-continued experience along these lines.

As to the time when changes of a serious character appear in the heart. In many cases of aggressive onset during the secondary symptoms, irregularities of heart action appear; exercise, such as double time for sixty seconds, will frequently produce intermittence, extrasystoles, and other disturbances of rhythm. Abnormally rapid action is common and under stress; a soft systolic mitral murmur may appear. In brief the symptoms of heart deficiency at this stage are precisely such as at times appear in the febrile stage of most infections, such as typhoid, rheumatic fever, septicemia, and the like. One might fairly assume from this fact that the changes in these instances are precisely such as appear in any infection, and such I believe is the prevailing opinion. In a few instances, however, death has taken place, and autopsies have demonstrated these manifestations to be due to typical syphilitic inflammatory alterations in the heart muscle or in its arterioles. Three such cases have been studied by me.

In one case of my series which terminated unexpectedly before the secondary rash had fully appeared, and before the diagnosis had been made, death immediately resulted from a minute perforation of the wall of the aorta, just above the ring. A pronounced acute arteritis and periarteritis was found throughout the myocardium, particularly involving the vasovasorum of the aorta. Large foci of round-celled infiltration, with parenchymatous degeneration of the muscle cells and an active hyperplasia of the connective-tissue interstitium, was found—all typical and unmistakable syphilitic changes, yet they appeared in the early secondary stage of the disease.

Grassman records similar observations, and since I believe that I, with others, have demonstrated that these specific inflammatory changes develop first in and about the arterioles of the heart muscle, we cannot then assume other than that serious involvement of the heart may begin before or with the secondary stage of the disease. Obviously the postmortem evidence of this fact is not large, because cases now rarely die in this stage of the infection when nearly all patients are more or less effectively treated, one must therefore rely largely on clinical evidence for the confirmation of this fact.

Several cases in the active early secondaries which were seen by us in the service of Dr. Fordyce, and which showed unmistakable evidences of myocardial disease, such as tachycardia, extrasystoles, murmurs, and other irregularities of tone, rhythm, and force, when submitted to vigorous antisyphilitic treatment, showed within three days the disappearance of these signs, and all symptoms of cardiac disease vanished without resort to circulatory measures except rest in bed. Such cases, together with the postmortem evidence which I have been able to collect, satisfactorily indicate to me that early syphilitic lesions frequently appear in the heart, that they may be serious, and that they then cause symptoms of a sufficiently definite diagnostic character.

Now that the spirochetes of syphilis have been demonstrated in the heart muscle lesions of this type,[2] there remains no argument as to the specificity or significance of the lesions. It is inevitable that there should follow them changes of a more or less permanent and often grave nature.

If, as I believe my previous study has indicated, the changes in the heart chiefly originate in and about the bloodvessels, it is plain that the onset of the changes in the heart should occur early, for there can be no doubt but that we have an early septicemia or lymphemia in syphilis. Therefore it seems fair to assume that cardiac lesions are to be expected among the earliest of all visceral disease in this infection.

If we are then correct in this assumption, from the nature of the heart physiology, the largely unregenerative character of the heart muscle, and the inevitable fibrotic alterations which must succeed myocardial discrepancies, it follows that energetic treatment is imperative immediately after diagnosis in lues if for no other reason than because of the almost certainty of cardiac invasion. Fortunately it is no longer a question in therapeutics as to when treatment should be instituted in syphilis, and since this point has been satisfactorily settled, I have no doubt but that fewer cases of death as a result of luetic lesions of the heart will be reported.

As to the signs and symptoms which appear in syphilis as an indication of involvement of the heart, much work still remains to be done. As we have already remarked the most frequent and earliest lesions found are arterial or myocardial ones, and we all recognize the difficulty of absolute diagnosis of either of these conditions even when they are fully established—small wonder then that the early signs and symptoms of syphilitic involvement of the heart are neither clear, definite, nor characteristic.

Insofar as our personal observations go, the earlier symptoms

[2] Buschke and Fisher, Deutsch. med. Woch., 1906, Nr. 19; Simmons, Münch. med. Woch., 1906, S. 1550.

are irregularity of action, more marked when strain is added, as by mild exercises or through nervous apprehension. Rapidity of action is also present in most cases, and it is incited to a degree and by conditions which in the normal would fail to elicit such a response. Pain and tenderness in the region of the heart demonstrated with or without heavy pressure over the precordium is present in a few of the early cases. I believe that these symptoms appear chiefly or only when extensive inflammatory lesions are present in the muscle or when dilatation has developed. I know, however, from clinical and postmortem evidence that pain and tenderness are not invariably present even in cases where actual cardiac aneurysm has developed. In no instances have I observed any significant alterations in the blood pressure except secondary modifications, when obvious decompensation was present, or in advanced cases when some such concomitant conditions as a nephritis complicated the picture. Neither have I observed any other characteristic alterations in the pulse in the early stages except the irregularity of rhythm and force already remarked. If I may be permitted to so express it, the characteristic of the irregularity of action in the early cases is its irregularity—its lack of system. I have never as yet observed anything indicative of a heart-block or auricular fibrillation in the early phases of the disease.

In the latter stages of the condition, that is, in the tertiary and quaternary periods, the signs and symptoms of cardiac disease naturally become much more certain, though rarely in my opinion definitely indicative of lues—the signs and symptoms of the case become rather those of a myocarditis, of a cardiac aneurysm, of heart-block and the like. For this reason the specific etiology is likely to entirely escape detection. Symptoms and definite signs of cardiac disease may be absolutely absent, as shown in several instances which came unsuspected to autopsy when marked lesions were found. One cannot therefore assume that cardiac complications are necessarily absent in any case of syphilis because signs and symptoms are lacking.

Of the manifestations which appear with the greatest frequency in long-standing cases of lues, I believe that irregularity of action, especially when under strain or stress, is probably the most frequent, as it is also in the earlier stages. With the irregularity of action often appear murmurs or the accentuation of preëxisting murmurs or other alteration in their character. As we have already remarked in the early stages, murmurs are not very frequent, though they may appear; but in the long-standing cases they are frequent. Analysis of my postmortem cases shows a definite endocarditis present in 74 per cent.; 14 per cent. of the aortic ring; none of the mitral alone but 34 per cent. of both aortic and mitral. In many instances activity was still manifest, particularly in the aortic cases.

In advanced cases, as in the acute, pain in the region of the heart sometimes with tenderness is not infrequent; but here it is commonly of an anginal character, and reflected to either pectoral region, into the back, or down the arms. We have been able in most marked examples of this sign to satisfy ourselves that the symptoms of pain and tenderness were associated with dilatation, and is such as may occur in any type of myocardial degeneration after exercise. It is not infrequently entirely relieved by the administration of digitalis or strophanthus, and I am inclined to assume that in such cases pain is really caused by the dilatation, though this in turn may be due to coronary disease. I have seen several instances of undoubted angina pectoris, with or without dilatation, relieved by specific medication, and therefore consider them probably luetic in nature. None of these cases have come to autopsy, and are therefore not capable of absolute proof.

Stokes-Adams syndrome has been frequently reported as a result of syphilitic or gummatous myocarditis. During the past two years 5 of these cases, all history and Wassermann positive, have come to my notice, 2 in hospital and 3 in consultation with other physicians. Although in all these, tracings and in 2 electrocardiograms, also, showed the rhythm to be typical of heart-block, syncopal attacks have appeared in but 1. One hospital case, alternately under the service of Dr. Oppenheimer and myself, a man, aged seventy-eight years, has no disturbances whatever, but goes about the wards complaining of nothing except the natural disabilities of his age. It is important to record in relation to the role which lues plays in heart-block that these 5 cases have all been submitted to active antisyphilitic medication, but it has in no way altered the block, although in 2 cases the symptoms of dyspnea, cardiac pain, and of defective capillary circulation have been greatly relieved. So far as I have been able to ascertain no cases of heart-block have been recorded in the acute stages of syphilis. Several investigators record improvement under modern methods of treatment in late cases, such as mine, but we have not been thus fortunate.

It can safely be said that in the tertiary stages at least there are no definite pathognomonic signs or symptoms of syphilitic involvement of the heart. Diagnosis must in most instances rest on the discovery of a cardiac lesion, which is not accounted for otherwise, and a response to the Wassermann reaction. I do not wish to be misunderstood to indicate that I consider the Wassermann reaction infallible, either in a positive or negative sense, but I do consider it as yet the most definite sign in the diagnosis of syphilis in the later tertiary or quaternary stages, especially if the case has been more or less well, though incompletely treated.

In the diagnosis of heart involvement in syphilis a serious impediment is placed in our way in regard to history. According to my

hospital statistics, based on confirmation by autopsy, only 30 per cent. gave a positive history. From my private records the percentage of positive history is here even less frequent. A certain number of these cases, more in private than in hospital practice, deny luetic history even when the truth would much better serve their purpose, and on the other hand, through lack of intelligence or observation, a considerable number of hospital patients overlook symptoms which would be observed by the more intelligent, and which when recited would definitely identify the condition.

Finally, I believe that the most definite and only certain criterion in a diagnostic way in cases of cardiac disease in lues is a betterment or cure of the conditions under purely specific medication. This has acted very satisfactorily with me in several instances of presumable syphilis, where the history and physical findings were doubtful and the Wassermann reaction inconclusive. To apply the therapeutic test in these cases does not appear any more unscientific to me than the administration of specific drugs in tumor of the brain, under the supposititious diagnosis of gumma when even the Wassermann is negative or indefinite.

While from the foregoing it must appear that the signs and symptoms of cardiac involvement in lues are indefinite, it will be granted that they are little more so than are those of most types of myocardial disease; but when signs and suggestive symptoms, especially with actual endocardial murmurs, appear without other likely cause, then the diagnosis either with or without the assistance of a history or a Wassermann reaction becomes quite sufficient. Several instances have appeared in my services in which the sudden, unexplained, and afebrile onset of an apparent aortic endocarditis has acted in a highly diagnostic way; in some such examples little opportunity for error exists.

Little need be said as to the progress of the involvement of the heart in lues once it has originated. The great frequency with which it terminated either fatally or in lesions which absolutely disqualify the patient from playing a normal part in the world's work is obvious to all who have considered the subject. Cases also exist with little or no disturbance even when extensive and serious lesions appear postmortem. We have found in our hospitals that a surprising number of cardiac cases in which the etiologic factors were obscure or entirely undiscovered, either responded to a Wassermann or on careful inquiry gave a history which justified the introduction of an antiluetic treatment, which was followed in a number of instances by such improvement that it could not be considered as otherwise than confirmatory. So general has been this result that we have frequently found it advisable to apply this therapeutic test even in cases historically and serologically negative.

As to the question whether the involvement of the heart may be

prevented in lues. An absolute answer is at this time difficult, because a sufficient number of cases which received vigorous and protracted treatment in the early stages of the infection have not as yet remained sufficiently long under observation to justify definite conclusions in this respect. This much, however, must be admitted in the acute cases: That those in the active, aggressive, and progressive periods of the secondary stage which have been treated by modern methods have thus far shown no recognizable cardiac complications. Furthermore, as before stated in cases where cardiac lesions or symptoms had appeared and vigorous methods of treatment were applied, disappearance of these signs and symptoms has followed in most cases.

Unfortunately this is a line of work which it is unlikely that I shall be able to follow out because most of the cases which come to an internist are not in this period of infection, but are in the late tertiary stage. Perhaps I may, however, be pardoned for stating in this not inapt place my belief founded on my studies in pathologic anatomy that an attempt to divide syphilis into periods or stages is unsound pathologically and unsafe clinically —one commonly finds so-called tertiary lesions appearing in the secondary stages of the disease and from time to time in the tertiary period, sudden and aggressive exacerbations of the process spring up which can be only compared to those which we are accustomed to ascribe to the secondary stage. There is no essential difference, except in degree or size between the granulomatous processes of the secondary stage and the gummas of the third period.

It is a curious fact that although we have recognized since the days of Paré that syphilis caused disease of the heart, and that aortic disease in particular was frequently caused by it, we have apparently not appreciated until recently that these syphilitic manifestations should receive the same recognition and treatment which has in the past as in the present given such brilliant results in the treatment of syphilitic lesions elsewhere.

Collins and Sachs,[3] and Longcope, in 1910, called attention to the good results which follow the treatment of syphilitic lesions of the heart, just as like changes are managed when they appear elsewhere in the body. But few text-books as yet, however, point out the frequency of the complication or the necessity of adopting in it the same energetic line of treatment used in other forms of lues. Few practitioners apparently appreciate the results which may be reached by this means or the serious termination which is practically certain to follow in case no adequate treatment is instituted.

As an illustration of these features I wish to cite briefly the following case:

[3]Trans. Assoc. Amer. Phys., 1910.

Ten years ago a well-known colleague, in the course of his work, acquired a chancre in the end of the nose. Vigorous mercurial and iodine treatment had been promptly instituted under the supervision of an eminent syphilographer. Prompt disappearance of the obvious signs and symptoms of this disease took place, and the patient, himself an authority in this branch of work, continued the treatment for a period of two years, after which no evidences persisting, treatment was dropped. After a severe season of heavy work, early this past summer, he noticed that his heart intermitted, that some dyspnea was present on slight exertion, and an oppressive pain was almost constantly present in the region of the precordium. I found on examination that the heart was irregular, that the action became markedly intermittent on slight exertion, with the appearance of extrasystoles and of slight cyanosis and pallor. Auscultation showed the presence of a soft apical systolic murmur, not transmitted toward the axilla but upward over the sternum. A distinct systolic murmur was found at the aortic area transmitted into the vessels of the neck. The cardiac area was not increased, but heavy percussion over it caused discomfort. The Wassermann reaction was next day found strongly positive, but without waiting its determination the patient was the same day given 0.6 gram of salvarsan intravenously. A considerable reaction followed, and for several days the patient was seriously ill, with pains in the muscles and bones, high fever, and rapid pulse. Nonetheless, inside of one week the murmurs had decreased in intensity and the heart had become more regular and forceful in its action, and by the time that he was able to be about the cyanosis and dyspnea had vanished. Mercury was then administered and the patient has since remained under careful observation, though he is now able to continue his large practice. Two months later the intermittence had entirely disappeared, and after four months no heart murmurs can be found even after exertion.

As to the best methods of treatment. Although I do not feel that sufficient time has yet elapsed for me to draw definite conclusions from the cases which I have had under observation, certain facts have, however, come out which I believe may be of value to others, since some of them have been learned by me at the expense of considerable worry.

I may begin in this respect by the statement that so far as my experience goes the special type of treatment must be determined by the results on the patient—there is no other adequate measure. No two cases permit of identical methods. It is at present my chosen method of treatment to confine the patient to bed when the signs of cardiac disease are such as would suggest this step independent of the question of syphilis, but not otherwise. I believe that we have in the past been perhaps too frequent in our

use of the bed in the treatment of all manner of circulatory disturbances. Many patients, especially young persons, do better if allowed up, with restrictions, of course, especially in the direction of excitement and exercise; entire suppression of muscular effort in my opinion is usually contraindicated.

If the indications of cardiac discrepancy demand it I give digitalis, morphine, strophanthus, or what other drug is apparently indicated by the condition and symptoms of the patient. In brief, I treat the case primarily as one of primary circulatory disease. I then begin the use of mercury, and my general preference is for the salicylate administered hypodermically in sterile albolene. I push this drug until definite but not poisonous indications of its effect are reached, afterward decreasing or intermitting its administration. In some cases mercurial inunctions appear more desirable, in other mercury by mouth; and I have at present a patient under my care who tolerates it only when administered in the old-fashioned vapors; speedy progress without discomfort having followed since this method has been adopted. I do not give the iodide in this period of the treatment, though I know no reason why it should not be so employed by those who have confidence in its specific action.

After the case has thus been under observation and treatment at least for a few days, in suitable instances, I recommend the use of salvarsan, not because I consider it indispensable, nor because I think it a more certain specific than mercury in the management of circulatory involvement in lues, but because given in the customary doses it has in most cases a more rapid effect than mercury alone. I believe that it affects some cases in which mercury seems inert, and also in the average patient I follow it up by the resumption of mercury.

In this form of syphilis, salvarsan is best administered intravenously. I have tried both methods, and my earlier preference was for the deep muscular injection. I am still of the opinion that this method may possibly give the most lasting effects in the disease, but that is not what I elect to use salvarsan for in the cardiac complications of lues, but for its quick effects and especially for its direct and speedy action on the bloodvessels and their immediately adjacent tissues. Added to this are the occasional foci of necrosis or abscess formation which may follow the intramuscular method even in the practice of the most careful technician, if he but continue the method long enough—a statement which a few months ago I might perhaps have questioned, but not so now. As to the special method of intravenous administration I have little to say; most of my cases have received the treatment from my associates, interested purely in syphilis, and I have therefore had cases managed by various technical methods. I have no preference for either the one or the other, and I believe that the best method is that with which the operator is himself most familiar.

At first I was accustomed to administer the full dose of 0.6 gram at one sitting; that is, for fully developed adults; following this up later by other doses if necessary, and by energetic after-treatment with mercury. Although I still maintain that theoretically this is the preferable method of treatment, acting on the basis of the theories in regard to its action, experience has shown that this is a dangerous procedure, and three cases so treated under my advice have nearly died as a result of the drug and its after-effects.

One of these cases which I saw with Dr. Wren I shall never forget. It was that of a small but previously vigorous man who had contracted his lues some twenty years before, and who had been treated at that time by the usual methods in vogue. He had since lived liberally in all respects, but without any apparent return of his syphilis. He had meanwhile acquired a family of three persons, and had carried on a large and important law practice.

When seen he was suffering from marked dyspnea, especially on slight exertion. Dilatation of the right and left ventricles was present. Both auricles were dilated. The heart action was irregular and intermittent at times; auricular fibrillation was perhaps present, though a satisfactory polygraph tracing could not be obtained. Most of the time he showed a typical heart-block, with periods of characteristic attacks of syncope. The recent history abounded with frequent seizures of this syndrome. I agreed in advising the use of salvarsan, and soon after the drug was given intravenously by a careful, experienced, and thoroughly reliable operator. Soon after the injection the ventricular contractions dropped to ten per minute; the patient became unconscious, went into collapse, and apparently became moribund. Only the most vigorous and persistent treatment saved his life, and he was for a long time thereafter gravely ill. The arsenic was in this case followed up by mercury, with relief of his cardiac distress and of most of the other signs and symptoms as well, but the heart-block has persisted. He has been able to resume his practice. No more salvarsan has been given, both because the doctors were not anxious to repeat their experience, and also because the patient absolutely refused to repeat the treatment, especially as he is now comfortable and apparently progressing under mercury and the iodides.

A further case illustrative not only of the dangers and benefits encountered in the treatment of cardiac syphilis by means of salvarsan and also of the manner in which the drug acts is probably worth recording in brief, particularly because of its characteristic history and the immediate bearing on the manner in which the drug affects the cardiac tissues in these cases.

The patient, a male, aged sixty-three years, entered my service at the City Hospital in February, 1910. He was a cook, formerly

a soldier in the Prussian Army. He was married, but had had no children. He came of a healthy and long-lived family. His juvenile history was unimportant. He had rheumatism ten years previous to entering the hospital, and typhoid fever seven years ago. He was a moderate user of alcohol and tobacco. He denied not only the history of venereal infections, but also of all skin or mucous membrane symptoms which might be construed as of possibly syphilitic origin.

His chief complaint was of shortness of breath, especially on exertion. This symptom first gradually developed about one year before his entrance to the City Hospital, and was associated with pain in the precordium, headache, and swelling and cyanosis of the hands and feet. He lost between fifty and seventy pounds in weight during this time.

A summary of the chief points brought out by the physical examination were marked dyspnea on exertion, marked cyanosis of the face, hands, and feet, together with considerable edema of the hands and feet. The right pulse was small and indistinct, and was absent for most of the time. The left pulse was regular' the artery plainly palpable and thickened. The respiratory movements were shallow, rapid, and accompanied by sibilant rales, usually apparent even without direct auscultation.

The apex beat was visible and palpable in the fifth interspace, and four inches to the left of the midsternal line. The right cardiac border lay one and a half inches to the right of the midsternal line. The heart sounds varied greatly in rhythm, and in the occurrence, disappearance, and location of murmurs. The thorax presented considerable bulging and enlargement of the left side. Percussion demonstrated the presence of a broad area of dulness beneath the manubrium sterni, but no tracheal tug or abnormal suprasternal pulsations were found. There was enormous distention of the superficial thoracic veins which anastomosed below with the radicles of the superficial epigastrics. This venous anastomosis was especially definite on the left side of the body where the superficial veins of the arm and forearm were also much dilated.

The liver dulness was found to extend about a hand's breadth below the costal margin. The liver was firm on palpation, but somewhat tender. The spleen was enlarged, easily palpated, and tender. The abdomen contained considerable fluid.

Examination of the blood showed a constant polycythemia. The urine showed the continuous presence of albumin, casts, epithelial, and occasionally blood cells. The amount varied greatly, depending apparently on the condition of the circulation.

A diagnosis was made of aneurysm of the transverse arch, myocarditis, cirrhotic liver, and spleen, with secondary nephritis and polycythemia. Radiographs verified the diagnosis of aneurysm or aneurysmal dilatation of the transverse arch of the aorta, and

because of the size of the sac, with its non-pulsatile character, it was assumed to be filled with laminated clot.

Syphilis was assumed to be present because of old skin lesions and the lack of other explanatory causes, but the Wassermann reaction was first reported negative, but later, after treatment had been instituted, it was several times found to be strongly positive.

Some relief was at first experienced from rest, the use of digitalis, and of the other usual cardiac drugs indicated in such cases; but he began to relapse as soon as he was allowed out of bed and about the ward. He developed from time to time hydrothorax, foci of bronchopneumonia, and attacks of pleurisy. Marked abdominal ascites and general edema appeared, and from time to time suppression of the urine, grave dyspnea, precordial pain, and other evidences of circulatory incompetence.

Mercurial medication was attempted first by mouth, then hypodermics of the salicylate, and finally, by inunction. These measures failed to give relief, and as he promptly developed under each early symptoms of mercurial poisoning attempts at treatment with this drug were suspended. Both massive and small doses of iodide of potassium were then prescribed, but he promptly developed a profuse pustular rash, began to run temperature, and this was also given up.

The patient was slowly becoming worse in every respect; the edema had become great, the urinary secretion small, and he passed into a comatose condition from which he could not be aroused by hot packs, cardiac stimulation, diuresis, and the other usual measures. Hitherto we had hesitated to give salvarsan because of the precarious condition of his circulation, fearing a Herxhimer reaction, which might terminate the picture. Finally, as death seemed to be but a few hours distant, it was determined to attempt the drug; 0.3 gram of old salvarsan was injected slowly into a superficial vein. The respiration stopped and he was thought to be dead. Venesection gave a sluggish flow of greatly cyanosed blood. Salt solution was injected intravenously, the extremities elevated and bandaged, adrenalin, camphor and ether, strychnine, and digitalin, were administered hypodermically, and the patient slowly rallied. The pulse became perceptible, the kidneys resumed secretion, the tremendous peripheral cyanosis was relieved, and in two days he was conscious. After fifteen days the patient was walking about the ward in tolerable comfort. No apparent change could be made out in the supposed aneurysm, but the polycythemia became much reduced, the pulse which had formerly presented extrasystoles, pulsus alternans, a jugular direct, and all manner of polygraphic curiosities became full and regular, though that on the right side remained small and at times imperceptible. Improvement was rapid during the summer months, so that the patient

was able to walk about the hospital grounds; but attempts to resume mercurial medication always met with early toxic symptoms, and the old intolerance for iodides was still present. Digitalis now acted splendidly, as did also other cardiac stimulants, so that the circulation was maintained at a very satisfactory level.

The Wassermann reaction remained strongly positive, and this fall, as he ceased to gain ground, and urinary suppression, with symptoms of cardiac failure, again supervened, it was determined to repeat the salvarsan, though some difficulty was experienced in inducing the operator to undertake the second treatment; 0.2 gram was finally given intravenously, and again collapse occurred, but after vigorous management, with final recovery. Again marked improvement in the cardiac action and in the general strength of the patient took place. He was able once more to get about the hospital, and again became a tolerably comfortable ambulatory patient. Through the courtesy of my colleague, Dr. Potter, into whose service he had now passed, I was permitted to examine him. Apparently at this time, October, 1912, the retrosternal dulness had somewhat decreased in breadth.

In late November he developed a gangrene of the great toe of the right foot, preceded by great pain in this foot and leg. A diagnosis of embolism from a detached cardiac or aneurysmal clot was ventured. Death soon followed.

Through the courtesy of Dr. Larkin I am permitted to abstract the following data from the detailed protocol:

The retrosternal mass was found to be a widely dilated but not much sacculated arch, which together with the entire artery was extensively diseased and ulcerated, though most of the ulcerations were clearly in a healing and not progressive state. The walls of the aorta also presented marked longitudinal striations and folds which Dr. Larkin interpreted to indicate that shrinkage or contraction of the vessel was in progress. The heart was greatly enlarged. It showed a diffuse interstitial myocarditis, with occasional small gummatous scars clearly now largely healed, and undergoing rapid fibrosis. The general arteries were markedly diseased, but the coronary vessels were not extensively involved, and, as in the aorta, little calcification was present, for the process appeared to be essentially one of fibrosis and fatty degeneration. The small pulse on the right was explained by an old thrombosis, with a subsequent canalization of the right brachial artery.

The liver was greatly enlarged, and showed the results of chronic congestion, diffuse connective-tissue hyperplasia, and quite frequent healed gummatous scars. The spleen was much indurated and enlarged, no gummas could be made out in it. The kidneys showed a diffuse fibrosis, with nodules of compensatory parenchymatous hyperplasia.

The striking features revealed by the necropsy were the evidences

of extensive disease of the aorta apparently undergoing healing and the presence of a syphilitic nephritis, hepatitis, and myocarditis, all well advanced in healing.

Realizing that microscopic study of these tissues might give a clue as to the manner with which healing may occur in the heart muscle in syphilitic myocarditis under the effects of salvarsan, such an examination was made. It seemed that this should be of special value, because in this case definite signs of improvement followed the use of the salvarsan, and little mercury or iodine was used. The changes therefore in such an instance would seem to be almost entirely due to the effects of the arsenic. The corroboration of the clinical benefit of treatment by direct anatomical evidence appears also to us of great importance.

Microscopic Examination. The muscle cells of the heart show in the main a considerable degree of atrophy, but with certain exceptions this atrophy appears to have been of pressure origin and not due to inherent disease of the muscle cells. For the greater part the striation is well preserved, a good many, however, show longitudinal striation, and there are many enlarged and karyokinetic nuclei, but cytoplasmic alterations are mostly wanting, except in the cells of the papillary muscles, where brown atrophy is quite general.

The connective-tissue interstitium is universally increased. This applies not only to the endomesium, but also to the connective tissue of the endocardium and epicardium. It is notably evident that hyperplastic connective tissue is most abundant and the evidences of recent growth most manifest about the arterioles of the coronary trunks.

Another peculiarity of this interstitial overgrowth is its highly cellular character, as though of rapid and rather recent formation. Cicatrization, or true scar formation, is not evident except in the papillary muscles and in the foci of old gummatous inflammation. Notwithstanding the fact that the connective tissue is so highly cellular, so apparently recently formed, few infiltrating leukocytes or wandering connective-tissue cells are present, and even about the blood channels which are crammed with red corpuscles few indications of active inflammation are to be made out. Lymphocytes are particularly few in number, both in the connective tissue and in the walls of the vessels, except again in the papillary muscles, where foci of infiltration and actively hyperplastic cells are present. Connective-tissue necrosis is also infrequent, but in the papillary muscles it is taking place, and degenerated foci of considerable size, marked by diffuse deposits of fatty and amorphous granules, are shown.

Notwithstanding the fact that the gross examination indicated that the coronary vessels were not markedly involved, the microscopic sections showed that the walls were much diseased. The

muscle coats are largely disrupted and replaced by necrotic and fatty material, the elastica is so broken as to be hardly discoverable, and the intima is much roughened and eroded. As a general thing, the caliber of the vessels is enlarged. A striking feature is the absence of evidences of active infiltration or inflammation in the walls, such as would be marked, for example, by foci of round-celled infiltration or by active changes about the vasavasorum. The veins show marked atheromatous changes, similar though in lesser degree to those shown in the walls of the coronary arterioles. The venules and capillaries are generally surcharged with red corpuscles.

The scars found at various points in the heart walls, alike of the auricles and ventricles, and apparently representing the sites of old gummas, show under the microscope a replacement process of the muscle by a growth of young areolar tissue like that found elsewhere in the specimens. This tissue is strangely free from infiltrating or wandering cells and from marked cicatricial formation, and notwithstanding the apparently recent nature of this connective tissue and the presence of hyperemic vessels the blood trunks and their vicinity are surprisingly free from evidences of inflammatory reaction. There is nothing anywhere evident indicating activity of process and nothing now to signify that it is a syphilitic process.

Sections through the aortic wall show extensive atheroma, mostly without calcification, although numerous and large atheromatous cysts are present, together with considerable areas of necrosis. Many of the vasavasorum are surrounded by foci of infiltrating round cells, but the process in the intima and the subendothelial coats is definitely one of degeneration and not now of proliferation and progress. Attached to the intima are found numerous masses of clot, more or less organized. The whole process is definitely in a stage of healing, except perhaps about the vasavasorum.

Spirochetes could not be demonstrated in any of these sections.

Sections of other viscera showed almost universally similar changes.

The microscopic picture, so far as the heart is concerned, may be summarized as a fibroid myocarditis, singularly free from evidences of inflammation or cicatrization, except in the papillary muscles, where the disease lesions were all found most marked. The changes in the muscle cells are clearly secondary to those in the interstitium. Even in those places where scar formation extends entirely through the heart walls, inflammatory and cicatricial alterations are strangely few. The disease process apparently originated about the coronary vessels.

The changes are most advanced in the papillary muscles, and in those foci where gummas have apparently existed.

The picture of the entire process is one of definite and rapid healing, and one which is apparently taking place with the minimum injury to the surrounding parenchymatous tissues.

In a small group of tertiary cases we have employed neo-salvarsan in place of the older arsenical preparation. So far as we can determine we have received quite as good immediate results as with the older preparation, but of course, sufficient time has not yet elapsed to judge accurately as to this fact nor indeed as to the permanency of improvement under salvarsan. In a physician with long-standing lues now under observation, after a long course of hypodermics of mercury salicylate, one dose of neo-salvarsan was injected intramuscularly, with a striking improvement in heart action and the disappearance of an apical systolic murmur which had decreased but not disappeared under the mercury.

As to the use of the iodides in syphilis of the heart. I do not believe from my somewhat limited experience in acute secondary syphilis that this drug has any appreciable effect, and I am much inclined to believe with Collins and others, that the iodides have little really antisyphilitic or specific action. On the other hand, in tertiary cases, and particularly in such as show persistent evidences of heart-muscle infiltration, I have found in not a few instances that the iodides apparently do what neither salvarsan nor mercury does. Where irregularities, dyspnea, and a certain degree of cardiac distress have persisted after the arsenical-mercurial treatment, in these cases great relief has apparently followed from the employment of the iodides. I am myself not inclined to consider this as due to a specific action of the iodides since I have seen equal apparent benefit in cases of probably non-luetic myocardial disease, with negative Wassermann, negative history, and negative findings so far as syphilis is concerned. I believe that the iodides in these cases favor absorption of degenerative or inflammatory products, and so favor restitution of normal cardiac action.

In several cases under our observation not only has there been a marked improvement in heart action, apparently amounting to cure, but in some instances, as cited also by Collins and Sachs, there has been actual disappearance of a definite aortic murmur, supposedly due to an aortic endocarditis. But why should we wonder at the restitution of a sclerosed or ulcerated heart valve under syphilitic medication when we take as a matter of course the absorption of a gumma of the liver or brain under the same general treatment?

In a recent report before the Internal Section of the New York Academy of Medicine, Longcope records striking results from the arsenical treatment of syphilitic aortitis even in long-standing and advanced cases. Doubtless in Longcope's series of syphilitic aortitis many if not all his cases were complicated by myocardial lesions, and no doubt part of the benefit achieved in his aortic

cases was due to betterment of myocardial lesions, just as beyond question some of the symptoms of my cases of syphilitic cardiac disease have been in part relieved through the effects of the drug on the aorta, there is no possible differentiation, of course, when it comes to judging the effects of treatment in either instance.

Adjuvant treatment, as though the cardiac lesions were not specific but idiopathic or general, is, of course, indicated. A few of my cases have taken the Nauheim treatment at home or in Nauheim with apparent benefit. Practically all of them have had digitalis or strophanthus at times as indicated. It goes without saying that all these circulatory measures should be employed as in other types of heart disorder, but the point which I wish to bring out in this paper and to emphatically emphasize is that they are secondary and relatively unimportant—the great essential is to treat these syphilitic lesions as syphilis.

As to the manner in which antisyphilitic medication cures or relieves lesions of the heart in syphilis, I have as yet little direct absolute evidence to offer, nor is it likely that I shall be able in the future to secure much material of conclusive character in this regard. The case just reported is perhaps as direct as can be expected. Inasmuch as I believe that I have demonstrated from previous studies that the characteristic and most important lesion in cardiac involvement is a gummatous process or an infiltration, a true syphilitic myocarditis, it seems logical to assume that benefit can be reached only by the local death of the spirochetes and by the subsequent absorption of the exudate and foreign tissue laid down in the myocardium as a result of the syphilitic infection. If, as seems indicated by the case just reported, this does take place, then it is easy to understand how improvement in heart action follows so promptly as we have found in many but not all the patients under our observation.

I have purposely made only a few references to the literature of the subject, but have confined myself to the data which I have collected and on which I have based my personal conclusions.

Conclusions. 1. Serious involvement of the heart is frequent in syphilis. Epicardium, endocardium, or myocardium or all together may be so diseased.

2. Cardiac involvement may develop early in the infection, though its symptoms may not be apparent until late.

3. The signs and symptoms are those of cardiac disorder, and little or nothing except the history, general aspects, and the Wassermann reaction may indicate the true etiology.

4. Treatment should be first along indicated circulatory lines, secondary as to time, but most productive and important of all it must be specific.

5. Good results, cures in many instances, will follow appropriate antisyphilitic treatment.

6. The special method of treatment should be individual, but both mercury and salvarsan are efficacious in the condition; usually they are preferably combined, in some instances the former, in others the latter acts best. Iodine is an efficient adjuvant in at least some instances.

7. Treatment should be continued until a permanent negative Wassermann is attained. Subsequent to this the management of the case should be along circulatory, not luetic lines.

SYPHILIS IN THE ETIOLOGY OF FIBROUS OSTEITIS.[1]

By P. G. Skillern, Jr., M.D.,

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Aside from the acute and chronic bacterial infections, tuberculosis and neoplasms of bone, there is a group of bone diseases of which leontiasis ossea, osteitis deformans, and osteomalacia are examples, whose stumbling nomenclature almost cries out for the light of etiology. It is for the purpose of suggesting the etiologic relationship between one of this group, osteitis fibrosa, or better, as termed by Bloodgood, chronic osteomyelitis fibrosa solida, and tardy hereditary syphilis that this communication is presented. The most recent contribution on this subject is by Elmslie[2] who states: "Beyond the opinion that fibrous osteitis is an inflammatory lesion, we must at present acknowledge that we know nothing of its pathology." In an exhaustive communication on this and kindred affections Bloodgood[3] says: "I, therefore, have been unable to find any definite etiologic factor, and I cannot agree with those who look upon the lesion as the result of trauma. . . . I agree with all the more recent investigators that the disease is an inflammatory one, in which the medullary tissue is replaced by a new formation of connective tissue with or without cyst formation." After reciting the history of my case, I shall endeavor to establish the premises upon which I conclude that this, if not many other similar cases, is due to syphilis of the late hereditary form.

Case I.—X. Y., male, farmer, aged twenty-two years, was referred to me in the Surgical Out-patient Department of the University Hospital by Dr. Charles C. Wolferth, of Clarksboro, N. J., January 2, 1912. His chief complaint was left-sided limp.

[1] Read before the Pathological Society of Philadelphia, January 24, 1913.
[2] British Med. Jour., November 16, 1912, p. 1367.
[3] Annals of Surgery, 1910, lii, No. 2, 145.

He had enjoyed (and still enjoys) perfect health until about seven years ago, when aged sixteen years, when he was thrown off a horse, landing on the left hip—not a severe fall, however. He was treated for fracture of the femur for eight weeks by Buck's extension, and used crutches five or six weeks after that time. He was then able to get around without any assistance. After that he had pains every winter on walking; no pain when not moving the leg. Two years before the fracture when aged fourteen years he noticed pain, and on examining his leg found the thigh swollen and bowed—this being the first knowledge of his condition. The swelling was larger after than before the fracture. The leg was bowed before the fracture, but was not as short as it is now.

His family history was directly negative, but indirectly suggestive.

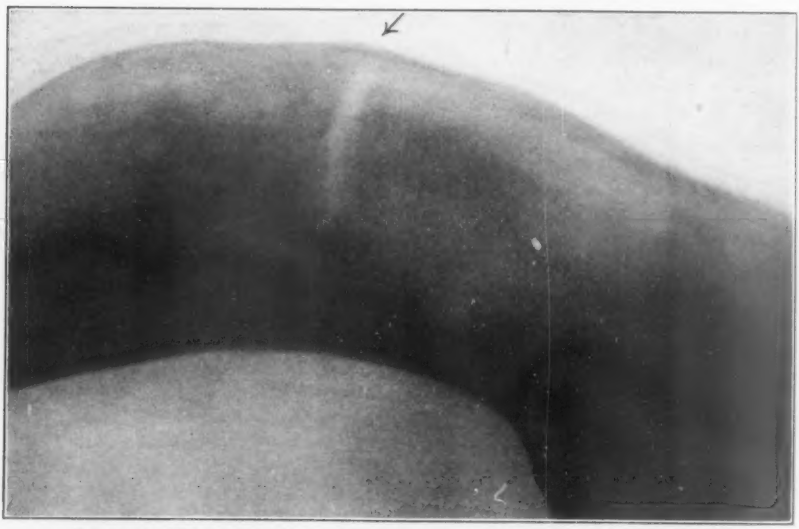

FIG. 1.—Syphilitic osteitis fibrosa of femur. Note thickening and roughness of surfaces, obliteration of medullary cavity, alternating areas of bone production and bone absorption, and line of pathological fracture.

Examination revealed the excellent general health and condition of a normal country lad. The left thigh was markedly bowed, with outward convexity (Fig. 1), and the femur was thickened, roughened, but not tender. There were no sinuses. Measurements taken from the internal condyle of the femur to the anterior superior spine of the ilium showed: Right leg, $18\frac{3}{4}$ inches; left leg, $16\frac{1}{4}$ inches, therefore $2\frac{1}{2}$ inches of shortening. None of this shortening was contributed by the femoral neck, as measurements from the top of the great trochanter to the symphysis pubis showed,

although there was apparent shortening here, due to the great bowing. The point of greatest convexity was opposite the termination of a straight line drawn from the anterior superior spine $5\frac{1}{2}$ inches downward.

The absolute passiveness and quiescence of the lesion, and the length of time during which it had existed without producing either the sinuses of tuberculosis or the cachexia of malignancy, at once suggested syphilis of the late hereditary form. After a few days the Wassermann reaction returned positive, and the skiagram (Fig. 1) revealed great increase in diameter of the upper half of the femoral shaft, with interruption of the medullary cavity and contiguous areas of bone production and bone absorption, with a clear and incomplete line at the point of greatest convexity, which indicated the site of the pathological fracture.

The patient was immediately put upon corrosive sublimate and iodide of soda and with the help of Dr. De Forest Willard an ambulatory brace was devised which transferred the weight from the left lower extremity from the pelvis to the ground.

During the eleven months that have elapsed since then (January 2, 1912) until the present time (December 2, 1912) the mixed treatment was maintained, neosalvarsan administered twice weekly, and the course of the disease studied by frequent skiagrams and blood examinations. During this time the patient maintained the best of health, and locomotion was considerably facilitated by the brace. Pains have disappeared gradually under brace and treatment.[4] Has very slight pain now, but none when resting.

On December 2, 1912, the Wassermann continuing negative and the latest skiagram (Fig. 2) showing more homogeneity of the texture of the bone, with complete healing of the line of fracture, it was thought the time had arrived for correction of the deformity by osteotomy and curetting of the area. In the meantime the correlation between this pathologic picture and that presented by osteitis fibrosa had impressed itself more firmly upon the writer.

This picture corresponds to syphilis, in that the essential lesions were those of formative rather than destructive periostitis, osteitis (which here was rarefying, predisposing to fracture), and osteomyelitis, and to syphilis of the late hereditary type in that it appeared at about puberty. The Wassermann reaction also was positive. So, too, it corresponds to osteitis fibrosa in its age of onset, the insidiousness of the process in the medullary cavity—the pathologic fracture after slight trauma being the first sign,

[4] D'Arcy Power (British Med. Jour., December 7, 1912, p. 1603) states: "We have found that the pain of periostitis and of osteitis in patients who have congenital or acquired syphilis is markedly improved" (under treatment by salvarsan).

and the slow development of shortening and limp the next, and the similarity between the skiagram in this case with those presented by previously reported cases of osteitis fibrosa—notably Figs. 5 and 7 in Dr. Bloodgood's article.[5] These two cases of osteitis fibrosa of the femur correspond to mine in their clinical history as well. So, too, Case IV of Elmslie's series,[6] presents this history, very similar to mine:

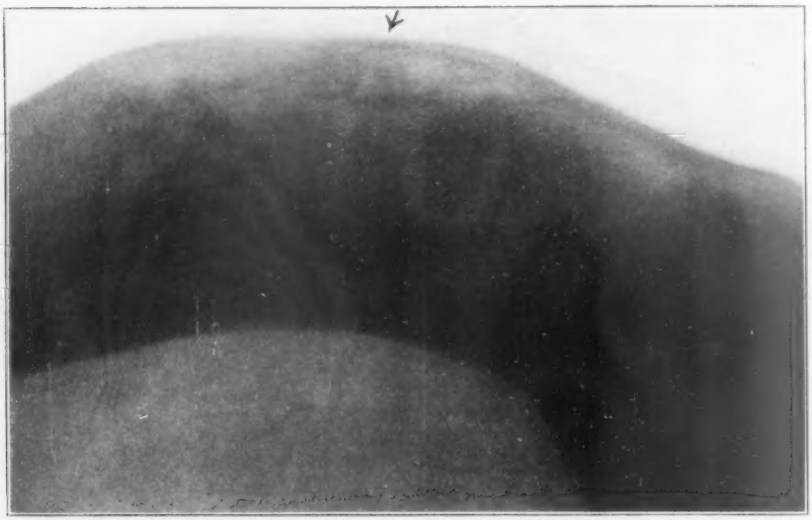

FIG. 2.—Syphilitic osteitis fibrosa of femur. Compare with Fig. 1, noting greater homogeneity of texture of bones and filling in of lines of pathological fracture.

CASE II.—E. B., female, when aged fifteen years, was admitted to St. Bartholomew's Hospital, London, in 1880, with the history of having fallen and injured her right thigh two years previously. Ten days before admission she again injured the thigh and a swelling had appeared. A hard swelling was found in the upper part of the right femur, as if the bone was thickened by about one inch. Diagnosis of chronic periostitis of the femur was made.

Two years and four months later she was readmitted, six months before she noticed that the right thigh was bent. There was then a sudden bowing outward in the right femur about 4 inches below the great trochanter, the bone being thickened at the bend. The right thigh was $1\frac{3}{4}$ inches shorter than the left. Under ether the bone was fractured, resulting ultimately in reduction of the shortening by one-half inch.

[5] Loc. cit. [6] Loc. cit.

The patient was next seen by Elmslie at the Metropolitan Hospital in 1907, twenty-nine years from the time of the first injury. The shortening was now 3½ inches; the femur was much thickened in its upper part and bowed outward. Skiagram showed that the neck, trochanters, and upper three inches of the shaft of the femur were expanded, rarified, and curved; the expanded area was subdivided extensively by trabeculæ. The lower limit of the diseased area was sharply marked off from the rest of the shaft. Misled by the history a diagnosis of endosteal sarcoma was made and amputation advised. This she refused. She returned eighteen months later, and having in the meantime seen the patient of Mr. Robert Jones, Elmslie was able now to make the diagnosis of fibrous osteitis and advised cuneiform osteotomy, which was refused.

Further light could probably be thrown upon my case by exploratory operation and microscopic examination, and Elmslie states that most writers upon the subject emphasize the difficulty of diagnosis of fibrous osteitis without this. He adds that while this is to some extent true, in the large majority of cases a diagnosis can now, in the light of experience, be made by means of careful clinical and skiagraphic examination. It seems to me that the microscope would be no better arbiter here than the methods described, for when the skiagram shows areas of bone-absorption and of bone-production we can picture in the microscope of our minds the busy osteoclasts demolishing and osteoblasts constructing respectively

As regards the Wassermann reaction, I can find no mention of or reference to it in any of these cases of fibrous osteitis,[7] and Dr. Bloodgood told me recently that it had not been taken in any of his cases before operation. The reason for this, however, is simply that all these cases occurred at a period which antedated the general employment of this test.

Conclusions. 1. Fibrous osteitis, in some cases at least, is identical with late hereditary syphilis of bone.

2. The connection of syphilis with this and other bone diseases of obscure etiology should be thoroughly worked out with the great aid now afforded by the Wassermann reaction.

3. This disease is curable by conservative measures, and may be struck off from the fast-shrinking list of bone diseases requiring amputation.

[7] For case of osteitis fibrosa cystica in which a Wassermann reaction was taken and was negative, see Murphy's Clinics, October, 1912, p. 741.

A CASE OF STRYCHNINE POISONING.

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J. B., aged forty-nine years, was admitted to the University Hospital on November 14, 1911, suffering from chronic lymphatic leukemia. He was a large, powerful man, weighing 190 pounds stripped. On December 5, at 8.15 A.M., he received through error 15 grains of strychnine sulphate in three capsules. At 9.15 A.M. I was sent for hurriedly. The patient was found rigidly extended on his bed, conscious, and extremely apprehensive that some terrible thing was about to befall him. He complained of intense pain in the back of the neck. From time to time his muscular rigidity increased suddenly, and he repeatedly asked to be held on the bed for fear that he should throw himself off. He was immediately given a quarter of a grain of morphine and preparations were made to wash out the stomach. A few minutes later, on attempting to pass the tube, it was found that the patient could not separate his teeth by more than half an inch. The trismus rapidly increased, the jaws became rigidly shut, and the patient passed into a severe tonic convulsion with cessation of respiration. During this he became intensely cyanotic, the pulse was very small, rather rapid, high tension, and with frequent intermissions, apparently due to the occurrence of extrasystoles. A probable diagnosis of strychnine poisoning was made at this time. Efforts made to open the mouth with a gag during the convulsion were unavailing, and resulted in loosening several teeth. One-tenth grain of apomorphine was injected. Shortly after, the stomach tube was successfully passed through a nostril and the stomach thoroughly washed out. The patient vomited repeatedly during this washing and the vomitus contained milk curds. The washing was repeated at 9.50 A.M., 10.20 A.M. and 11.00 A.M., and on each occasion there was vomiting. A second severe general convulsion occurred at 10.00 A.M. Shortly after this chloroform anesthesia was started. This was changed to ether at about 11.00 A.M., and the patient was kept continuously under the anesthetic until 4.30 P.M. An enema containing forty grains of sodium bromide and twenty grains of chloral hydrate was given at 10.30 A.M. No further severe general convulsions occurred but milder convulsive movements were noted at 11.00, 11.30 A.M., 12.00 M., and 12.25, 12.40 and 12.50 P.M. Other milder convulsive movements were not recorded. These mild convulsions were frequently precipitated by the patient's efforts to talk, by attempts to move him, by noises, etc. They occurred especially when the anesthesia became lighter. They consisted of momentary periods

of extreme stiffening of the trunk and extremities, and they were usually accompanied by involuntary cries and expressions of pain. They did not produce cyanosis. As it was felt that an indefinite quantity of the strychnine might have passed into the intestines, two drops of croton oil were placed on the tongue at 9.40 A.M., and this dose was repeated at 12.45 and 3.00 P.M. No bowel movement, however, occurred until evening; 123 c.c. of urine were obtained by catheter at 1.30 P.M. and 390 c.c. at 6.25 P.M. Thereafter micturition was voluntary. At 5.45 P.M. a pint of saline solution, with 10 grains of diuretin, was given by rectum, and this was repeated about once in two hours until noon of the following day. A flood of urine and numerous small stools were passed during the night. Repeated twitchings of the muscles were noted up to midnight. On the following morning the patient complained of soreness of the muscles, which persisted for several days. For several nights he was restless, and complained of muscular twitchings. On December 10 he developed a severe stomatitis, which lasted about ten days. No definite cause for this could be found, but it was supposed to be due either to an infection following the injury to his teeth or to the local irritant effect of the croton oil. He left the hospital on January 1, 1912, with no evident remaining effect of his experience.

This case is noteworthy because of the amount of strychnine taken (15 grains). The fatal dose is commonly stated to be ½ to 1½ grains, although according to Gadamer it is considerably higher (2 to 6 grains[1]). Over 1⅔ grains were recovered from the urine of our patient. Much larger doses taken by the mouth have of course been recovered from under prompt treatment; even from such exceptional doses as 75 grains, 60 grains, and 20 grains. The dose taken by our patient stands among the large ones on record. His recovery was due in part to the presence of food in the stomach, which retarded the passage of the poison into the intestines and in part to the prompt emptying of the stomach at the onset of symptoms; 4½ grains were obtained from the first stomach washings, but unfortunately, the later washings were not analyzed.

The case is interesting on account of the attempt to determine quantitatively the amount of strychnine excreted in the urine and the rate of excretion. Examination of the urine of fatal cases of poisoning have usually shown only minimal amounts and frequently none at all (Masing and Dragendorff[2]). Lesser[3] found traces in only 2 of 5 fatal cases. Kratter[4] found it in the urine of

[1] The literature of strychnine poisoning has been carefully summarized by E. Rapmund, Vierteljahrschr. f. gerichtl. Med., 1911, xlii, 243; E. Allard, Vierteljahrschr. f. gerichtl. Med., 1903, xxv, Suppl. 234; R. Kobert, Lehrbuch der Intoxikationen, Zweite Auf., 1906, 1153.

[2] Quoted in Allard, loc. cit., 299.

[3] Vierteljahrschr. f. gerichtl. Med., 1898, xv, 269.

[4] Wien. med. Woch., 1882, xxxii, p. 214.

a man who died in one and a half hours. On the other hand medicinal doses of this drug appear promptly in the urine. Mann found it in thirty minutes,[5] Kratter in thirty-five minutes, Rautenfeld in two hours, and Hale[6] in two to three hours. The excretion continues for one[7] to four days,[8] or possibly longer. In animals it may appear very promptly in the urine. Ipsen[9] found it in two and one-half minutes in rabbits and five minutes in dogs. Rapmund[10] found it in four minutes in rabbits.

The specimens of urine from our patient were carefully saved and sent to the hygienic laboratory of the University of Michigan, where the analyses were made under the direction of Dr. V. C. Vaughan. From each specimen 100 c.c. of urine were evaporated to dryness on the water-bath. The residue was extracted with 100 c.c. of alcohol and again evaporated to dryness on the water bath. This residue was dissolved in 100 c.c. of water. It was then made feebly alkaline with ammonia and shaken in a separating funnel with 100 c.c. of chloroform. The chloroform was evaporated to dryness and the residue was again taken up in slightly acidulated water, again made alkaline with ammonia, and again shaken out with chloroform. The residue from this last chloroform extraction was rubbed up with a few drops of concentrated sulphuric acid and heated for one-half hour on the water bath. It was again dissolved in water, to which ammonia was again added, until the solution was slightly alkaline. It was then shaken out with chloroform, the chloroform was evaporated to dryness, and the residue weighed.

The results of the analyses of the urine of our patient are shown in the following chart. Unfortunately no analyses were made of the urine which was passed between 6.05 A.M. on December 6 and that which was passed at 2.30 P.M. on December 7.

ANALYSES OF URINE AFTER TAKING 1.0 GRAM STRYCHNINE AT 8.15 A.M. ON DECEMBER 5, 1911.

Time passed.	Amount of urine in c.c.	Specific gravity.	Albumin.	Strychnine in grams.	Average per hour. Amount urine.	Average per hour. Strychnine.
December 5, 1.30 P.M.	123	.....	.....	0.0010	23	0.0002
6.25 P.M.	290	1.001	Positive	0.0200	58	0.0040
11.30 P.M.	500	1.010	.....	0.0490	100	0.0098
December 6, 1.15 A.M.	350	1.009	.....	0.0105	200	0.0060
2.55 A.M.	220	1.007	.....	0.0110	120	0.0060
3.45 A.M.	185	1.009	.....	0.0027	200	0.0032
6.05 A.M.	300	1.009	.....	0.0019	125	0.0007
December 7, 2.30 P.M.	290	.....	.....	Trace		
December 8, 24-hour specimen		.....	.....	Faint trace		
December 9, 24-hour specimen		.....	.....	None		

[5] Wien. med. Woch, 1882, xxxii, p. 214.
[6] Jour. Phar and Exp. Therap., 1909, i, 39.
[7] Kratter, loc. cit.
[8] Hale, loc. cit.
[9] Vierteljahrschr. f. gerichtl. Med., 1892, iv, 15.
[10] Loc. cit.

During the earlier stages of the poisoning the amount of urine was diminished. When catheterized at 1.30 P.M., 123 c.c. were obtained, and we have no knowledge as to how much of this may have been excreted previous to the onset of the poisoning. At best not more than 23 c.c. per hour were excreted during this period, and it seems probable that very little urine was formed during the acute symptoms. According to Grützner[11] the constriction of the renal vessels during strychnine poisoning inhibits the flow of urine despite the increased blood pressure. The marked increase in the second portion of urine (58 c.c. per hour) was due mainly to the improved renal circulation, for the salt solution enema given forty minutes before this urine was obtained could hardly have been solely accountable for the considerable quantity of urine. The subsequent flood of urine was evidently due in part to the enemata and in part to the improved renal circulation.

During the acute stages of the poisoning very little strychnine was excreted, only 1 milligram having been obtained from the urine passed at 1.30 P.M. Had the patient died within two hours still smaller amounts, probably only traces, would have been recovered from the urine.

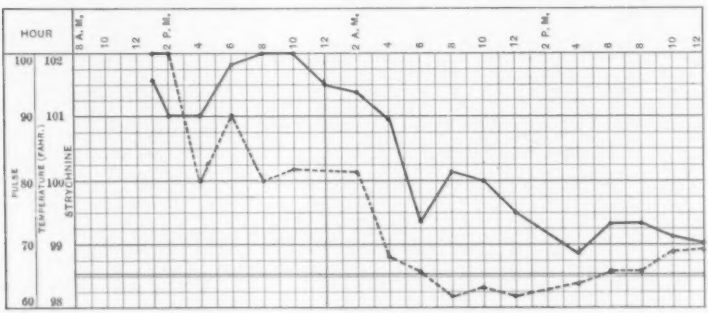
Following this period the excretion of strychnine increased rapidly, the maximum being reached between the hours of 6.25 P.M. and 11.30 P.M. during which period 49 milligrams were excreted, an average of almost 1 milligram per hour. The amount excreted diminished rapidly toward morning, the rate between 3.45 A.M. and 6.05 A.M. being less than 0.1 milligram per hour. During the second day no analyses were made. On the third day a distinct trace was obtained, and on the fourth a faint trace. On the fifth day no strychnine was obtained. Altogether, about 96 milligrams ($1\frac{3}{5}$ grains) were recovered from the urine. The analyses are noteworthy in showing (1) how little strychnine was excreted during the most acute stage of the poisoning, (2) that the major amount was excreted within twenty-four hours, and (3) that the excretion was not completed for three or four days.

But few observations on the effect of strychnine poisoning upon the body temperature of man are available. Observations on animals by Harnack,[12] Harnack and Hochheim,[13] Högyes,[14] Kionka,[15] and Rapmund,[16] indicate that, as a rule, the temperature rises during the convulsions and tends to fall between them. Indeed, in some instances the fall has predominated and the temperature was lowered throughout. Rapmund[17] records a rise from 39.1° to 42° C. on one dog, and several similarly large rises are on

[11] Arch. f. Physiol., 1875, xi, 385.
[12] Arch. exp. Path. u. Phar., 1903, xlix, 157.
[13] Zeitschr. f. klin. Med., 1894, xxv, 16.
[14] Arch. f. exp. Path. u. Phar., 1881, xiv, 113.
[15] Abstract in Fortschr. d. Med., 1898, xvi, 941.
[16] Loc. cit.
[17] Loc. cit.

record.[18] Experiments by Kionka and by Harnack indicate that both the heat production and the heat elimination are increased, the resulting body temperature depending upon which of the two predominates. Harnack found that doses of strychnine which produced no convulsions might increase the heat production.

One hesitates to transfer these results to man, both because of the varying results obtained on animals and because of the finer temperature adjustment in man. Only occasional observations have been made upon the body temperature in cases of human poisoning with strychnine. Barthélemy[19] and Lesser[20] record normal temperatures. Habel's[21] patient, who took about 0.18 gram at 8.00 A.M., showed an evening temperature of 38° C., with subnormal temperatures on the following days. Honigmann's[22] patient showed a temperature of 38.1° C. twenty hours after taking the poison, and for several days his temperature ranged 38° and 38.4° C. (100.4° to 101.1° F.). He had an acute nephritis. In Ott's[23] patient the temperature rose to 101° F. on the first and second days, subsiding on the third day with rapid and complete convalescence. Wood states that he has never seen a temperature chart which showed fever after strychnine poisoning, nor have I been able to find a complete chart. The following chart



Temperature showing in continuous line; pulse in broken line. For the week previous the temperature had been 97.8° to 98.6° F., pulse 61 to 94.

is therefore of interest, since it shows a definite elevation of temperature for over twenty-four hours after taking the poisonous dose of the drug. Rectal temperatures were taken every two hours from 1.00 P.M. on the day of the poisoning to 4.00 A.M. on the following day, after which the temperature was taken in the axilla or by the mouth. These records show a marked and continued elevation of temperature, the highest being 102° F. It is

[18] Hégyes, Loc. cit.
[19] Loc. cit.
[20] Deut. med. Woch., 1889, xv, 435.
[21] Ann. Hyg., 1885, xiii, 130.
[22] Münch. med. Woch., 1899, xlv, 7.
[23] Med. News, 1894, ii, 270.

noteworthy that all of these temperatures were taken after the severe convulsive stage had passed.

In animals both heat production and heat elimination are increased. One may judge the heat elimination in man roughly by the warmth of the extremities, the presence of perspiration, and the size of the peripheral pulse. During the early convulsive stage of the poisoning our patient had a very small radial pulse and the extremities were cool; but throughout the latter part of the first day the skin was warm and was covered with a moderate perspiration, while the radial pulse was unusually large; all of which characters we have learned to associate with a rapid rate of blood flow through the arm. Apparently, therefore, the body was eliminating heat in excessive quantities after the convulsive stage was over, and since its temperature remained elevated, it seems probable that the heat production was also markedly increased. When, however, we consider the fine adjustment of heat regulation in the normal individual and the rapidity with which any excessive heat produced in the body is eliminated, it is surprising that the elevation of temperature should have persisted for over twenty-four hours in our case, for two days in Ott's case, and for several days in Honigmann's case. One can hardly avoid the conclusion that strychnine poisoning may disturb the fine adjustment of heat regulation in the body, and that in a certain sense, we have a condition analogous to that which prevails in fever.

In conclusion I wish to thank Dr. V. C. Vaughan for his valuable suggestions and for the analyses which have made the case one of unusual interest.

INSUFFICIENCY OF THE PULMONARY VALVE.

By Herman B. Allyn, M.D.,

Associate in Medicine, University of Pennsylvania; Physician to Philadelphia General Hospital, Philadelphia.

A student who wishes to investigate this subject will find himself indebted especially to four writers, Barié, Gerhardt, Gibson, and Pitt, and most of all to the first mentioned.

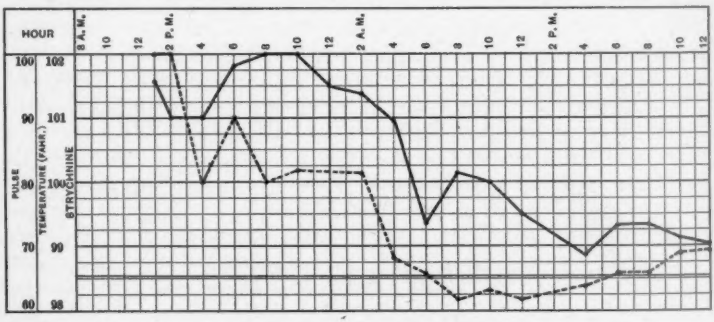
Barié[1] in the historical introduction to his paper reproduces a case reported by Morgagni[2] which is of great interest: "The patient was a young girl, sick and bedridden since birth, affected with peristent dyspnea and lividity of the skin. She died when sixteen years old. At the autopsy the right ventricle was found dilated, the pulmonary valves were cartilaginous, and so united as scarcely

[1] Arch. gén. de méd. 1891.

[2] De Sedibus et Caus. Morborum, epist. 17, chap. 12, t. i, p. 359, trad. Desfossez, 1837.

record.[18] Experiments by Kionka and by Harnack indicate that both the heat production and the heat elimination are increased, the resulting body temperature depending upon which of the two predominates. Harnack found that doses of strychnine which produced no convulsions might increase the heat production.

One hesitates to transfer these results to man, both because of the varying results obtained on animals and because of the finer temperature adjustment in man. Only occasional observations have been made upon the body temperature in cases of human poisoning with strychnine. Barthélemy[19] and Lesser[20] record normal temperatures. Habel's[21] patient, who took about 0.18 gram at 8.00 A.M., showed an evening temperature of 38° C., with subnormal temperatures on the following days. Honigmann's[22] patient showed a temperature of 38.1° C. twenty hours after taking the poison, and for several days his temperature ranged 38° and 38.4° C. (100.4° to 101.1° F.). He had an acute nephritis. In Ott's[23] patient the temperature rose to 101° F. on the first and second days, subsiding on the third day with rapid and complete convalescence. Wood states that he has never seen a temperature chart which showed fever after strychnine poisoning, nor have I been able to find a complete chart. The following chart



Temperature showing in continuous line; pulse in broken line. For the week previous the temperature had been 97.8° to 98.6° F., pulse 61 to 94.

is therefore of interest, since it shows a definite elevation of temperature for over twenty-four hours after taking the poisonous dose of the drug. Rectal temperatures were taken every two hours from 1.00 P.M. on the day of the poisoning to 4.00 A.M. on the following day, after which the temperature was taken in the axilla or by the mouth. These records show a marked and continued elevation of temperature, the highest being 102° F. It is

[18] Högyes, Loc. cit.
[19] Loc. cit.
[20] Deut. med. Woch., 1889, xv, 435.
[21] Ann. Hyg., 1885, xiii, 130.
[22] Münch. med. Woch., 1898, xlv, 7.
[23] Med. News, 1894, ii, 270.

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to leave an orifice as big as a lentil for the blood to pass through. But in addition to this orifice there were some small membranous fleshy growths placed in such a manner as to fulfil the function of a valve in permitting the blood to pass out, acting as an obstacle to blood that might regurgitate."

Barié's study of insufficiency of the pulmonary valve is based upon 58 cases; in 43 of them there were autopsies which justified the diagnosis; in 8 the observations were exclusively clinical, while 7 were obtained from references in the literature.

In speaking of the pathologic anatomy, Barié refers to the fact that there may be variations in the number of the valves. There may be two or four or five instead of the customary three. Grawitz reports an interesting case in which a leaflet occupied the anterior and posterior thirds of the lumen of the artery, while the middle third had none. There was no trace of endocarditis. In my first case, to be reported later, there were four leaflets. In a case reported by Kolisko there were also four valves, "but the posterior was much smaller than the other three."

Often a difference in the number of valves is associated with malformations, such as communication between the ventricles, as in cases reported by Lambl and Litten. The valves themselves may be defective through atrophy, shortening, or deformity. Barié refers to a curious case which he saw at autopsy in which a baby, aged three and a half months, had two normal leaflets, but the third was small and rudimentary, permitting regurgitation.

Bouillard reports a case in which the pulmonary artery was guarded by a horizontal partition pierced at its centre by a perfectly circular opening 0.006 mm. in diameter. This sort of hymen presented upon its convexity three small folds or loops. Though this patient suffered from infancy with extreme dyspnea and cyanosis of the face, and had, moreover, a persistent foramen of Botal, she died at an advanced age.

The valves may be fenestrated. In such cases they are supposed to be unduly thin, permitting partial rupture and even some small loss of valve substance. Several interesting cases have been reported.

Endocarditis of the valves is another cause of insufficiency. It may lead to complete destruction of one or more leaflets. The valves also may be thickened, retracted and of almost cartilaginous hardness by a chronic proliferating process, or, on the other hand, they may be covered with vegetations.

Rarely aneurysm of the valves is found. Barié has found 3 cases. Ulcerative lesions also occur and may result in perforation, as indeed may aneurysm, and occasionally in destruction of one or more leaflets.

Rupture of the valves, while a rare accident, has been encountered by Bernhardt, Wahl, and Chevers.

LESIONS OF THE PULMONARY ARTERY. Insufficiency of the pulmonary valve may be due to narrowing of the pulmonary orifice. Out of 43 cases examined by Barié, 23 showed stenosis and insufficiency. In 9 there was dilatation of the artery, due partly to the distending force of the systole of the right ventricle and partly to disease of the artery itself.

Atheroma of the pulmonary artery has been found in a small number of cases by Chevers, Wilks, Benedict, and Bristowe.

As to the frequency of the lesion, C. Gerhardt[3] quotes Weckerle:[4] In 846 Munich cases the right heart alone was involved in 3.9 per cent.; in 1.54 per cent. the pulmonary artery in general and in 0.59 per cent. the pulmonary valve alone was affected. Willigk in 4547 dead bodies found inflammation of the pulmonary valve 9 times; twice this valve alone was involved.

C. Gerhardt has assembled 29 cases, with autopsies. Although inflammation of the valve is given as the cause in three-fourths, rheumatic fever is recognized positively as the cause in only 7; 1 only is assigned to gonorrhea, whereas in 60 grouped by Pitt as infective, gonorrhea was put down as the cause in 8.

The age in Gerhardt's cases varied remarkably, the youngest being eleven and the oldest aged eighty-four years; nearly one-third died in the fourth decade and one-third died in the second and third decades.

INCOMPETENCE OF THE PULMONARY VALVE. Dr. G. Newton Pitt,[5] says that this is the rarest of valvular lesions of the heart, only 24 cases having been noted in the postmortem room at Guy's Hospital out of 16,000 examinations during a period of thirty-two years. Pitt has added 51 to those already reported (39 being unpublished cases from the records of Guy's Hospital), making a total 109, besides 30 published clinical cases which were not verified after death.

As to etiology, 60 are classified as infective endocarditis, 18 due to dilated pulmonary artery, 14 to aortic aneurysm pressing on the pulmonary valve, 13 to abnormality in number of valves, 14 to pulmonary stenosis, while 6 are unclassified. The recorded ages in the 60 infective cases show that the lesion is most frequent between the ages of twenty-one and thirty, but is nearly as frequent from eleven to twenty years, (13 cases) and from thirty-one to forty years (12 cases). At other ages it is rare.

No obvious cause was found in 21; a patent ventricular septum in 10; congenital pulmonary stenosis in 8; patent ductus arteriosus in 3; gonorrhea in 8; puerperal infection in 5; pyemia in 4; pneumonia in 5 cases.

All four valves were affected in 4 cases; hemoptysis and dyspnea

[3] Charité Annalen, 1882, xvii, 255.
[4] Ueber Ulceröse Endocarditis der Pulmonalk'appen., Münch. med. Woch., 1886.
[5] Allbutt's System of Medicine, 1909, vi, 310.

were the symptoms chiefly noticed. In 8 the implication of the pulmonary valve was definitely diagnosticated. In 5 only a systolic bruit appears to have been observed. In 3 it is definitely stated that no bruits could be heard. In others both a diastolic and a systolic bruit were noted.

In 5000 autopsies mitral stenosis was present in 19 out of 21 in which dilatation of the pulmonary artery was noted, and is consequently the chief lesion to be considered. It was the dominant lesion in both of my cases. Graham Steel, G. A. Gibson, Sir J. Barr, and Sir Dyce Duckworth have published over 20 postmortems secondary to mitral stenosis. There were 3 more cases at Guy's between 1901 and 1906.

Dilg has collected the cases showing abnormal number of cusps: Two pulmonary valves, 64; four pulmonary valves, 24; five pulmonary cusps, 2.

Pulmonary stenosis (14 cases): In 8 there was ulcerative endocarditis; in 2 a dilated pulmonary artery; and 1 only two cusps. In 3 a diastolic murmur was heard in spite of a congenitally stenosed pulmonary orifice.

Pitt calls attention to the remarkable fact that in cases of the most extreme mitral stenosis in which a similar defect is ultimately set up in the tricuspid valve the pulmonary cusps invariably escape and do not show even a trace of thickening. The influence of rheumatism as a cause is far less in the pulmonary than in any other valve.

The free margins of the cusps were more or less adherent in 18 and retroverted in 4 cases.

The statement usually made that pulmonary incompetence is a congenital defect is not accurate. About one-quarter of the collected cases showed evidence of old pulmonary stenosis, and in the same proportion there was some abnormality in the number of the valves. There is practically no evidence that trauma is a cause of incompetence.

Clinical Symptoms of Pulmonary Incompetence. In regard to the symptoms and clinical course, Pitt says that it is possible to make two groups, one in which the course is rapid, sometimes with no definite symptoms pointing to the heart, more frequently with signs of a general infective process, such as puerperal septicemia, in which the heart may be discovered to be involved. In these cases in more than one-half the number in recent years a correct diagnosis has been made.

The second group comprises much the larger number. There are definite cardiac symptoms, such as dyspnea, cough, edema of the lower limbs, etc., and a careful study of the physical signs will in most instances enable one to discover the lesion. It must be admitted, however, that where there are multiple lesions, especially aortic insufficiency, as in both of my cases, the diagnosis requires

some courage, not to say boldness, as well as skill. The most important considerations in the diagnosis are:

1. The size of the right ventricle: The cardiac dulness is increased in width, the apex beat is displaced to the left, but not downward, except of course in combined lesions. In some cases pulsation can be detected in the second or third left intercostal spaces, a pulsation supposed to be due to the infundibulum of the right ventricle.

2. Thrills are sometimes felt: They may be systolic or diastolic in time, the former indicating stenosis of the pulmonary valve.

3. A postive jugular pulse has been noted in some cases.

4. The most important sign is a diastolic murmur, with maximum intensity along the left border of the sternum in the second intercostal space. It is conveyed down the sternum toward the fourth interspace. Exceptionally it may be heard near the apex of the heart, or even in the epigastrium; when very loud it has been heard in the interscapular region. The quality varies widely. Some writers (especially Gerhardt) speak of it as rougher than the aortic diastolic murmur but I do not believe this is so frequent as to be of value in diagnosis. It could not be determined in either of my cases.

The pulse is soft and regular. Subjective symptoms are chiefly those referred to the lungs; as dyspnea, cyanosis, cough, spitting of blood from congestion, or infarct.

Bamberger has described a pulsation of the border of the right ventricle between the ensiform cartilage and the seventh right costal cartilage, and says that pressure of the finger here detects a thrill. Gerhardt has demonstrated it twice. The diastolic murmur is said by Bernhardt, to be stronger in expiration.

Gerhardt thinks we should be able to hear a double sound in the arteries of the lung in pulmonary insufficiency analogous to that heard in the arteries of the trunk in aortic insufficiency. He has heard it five times, but in only one case was pulmonary insufficiency established by autopsy. He says the sounds are best heard farthest from the heart, at the outer border of the right shoulder-blade. He describes, further, "an audible capillary pulse of the small circulation," which he has heard in three cases. It consists in an increased intensity of the vesicular breath sounds during systole. In his cases the sound was heard two to four times during a slow inspiration.

Gerhardt also gives tracings of the air pressure in the bronchi and trachea obtained by introducing a tube connected with a manometer into one nostril; the breath is first drawn in, and then held and then breathed out through the other nostril. The curve in pulmonary insufficiency resembles an exaggerated radial sphygmogram in aortic insufficiency.

Case I.—The first patient was a boy admitted to the Philadelphia General Hospital in March, 1910, with extreme dyspnea

and anasarca, said to be of four months' duration. His father and mother were living and well. The patient was one of thirteen children, eight surviving, the oldest aged twenty years, the youngest one month.

The boy had had mumps, diphtheria, and smallpox when quite young; his first attack of rheumatism had occurred when five years of age, since which time there had been several attacks. Scarlet fever occurred two years before his admission to the hospital.

While the boy was fifteen years old at the time of his death, he was not more mature in mind or developed in body than a boy aged ten years. He was small of stature, and there was no development of hair upon his body. Following his first attack of rheumatic fever when he was five years old, he was dyspneic on exertion, so that he could not run and play with other children.

In 1909 he was taken to the Mary J. Drexel Home because dyspnea was so great as to compel him to stay in bed. From that time to his death he was bedridden most of the time. After prolonged rest in bed, sometimes with the relief afforded by the withdrawal of ascitic fluid from the abdomen, he would recover sufficiently to be in a wheeled chair, or even to go home; but he would soon return, with an increase in dyspnea, more cough, inability to lie down or to sleep, and more or less cyanotic. Much of the time his condition was truly pitiable.

After tapping on October 5, 1911 pulsation of the liver was distinctly visible beneath the costal margin, projecting from it to the right of the epigastrium, and pointing toward the umbilicus was a prominent mass about the size of a small orange, which was soft fluctuating, and painless. Pressing in deeply one could feel a hard nodule about the size of a hickory-nut, which was also free from tenderness. The enlargement was looked upon as a distended gall-bladder, the hard nodule as a stone. The fluctuating swelling above described did not fully reach down to the lower border of the right lobe of the liver; it was possible therefore that it was the gall-bladder which was kept from reaching the lower border by adhesions, or that it was a much softened fluctuating gumma. The latter was rendered possible by the existance of an aortic insufficiency which had developed since the previous admission of the patient in 1910, and by the detection of a positive Wassermann reaction. There was also over the left lobe of the liver a flattened oval elevation about three inches in transverse and two inches in vertical diameter.

October 17. One gallon of turbid yellowish fluid was withdrawn from the abdomen. Following the last tapping the swelling in the region of the gall-bladder was less distinct and that in the region of the left lobe more so.

October 18. The apex beat at present is in the sixth interspace, midaxillary line, six and one-eighth inches from the tip of the

xiphoid. The right border of the heart is two finger breadths to the right of the sternum in the fourth and fifth interspaces. Pulsation is visible over the abdomen and the chest. Both right and left lobes of the liver pulsate strongly. There is a faint presystolic thrill at the apex; no thrill is felt at the other orifices. At the apex there is a pronounced thumping systolic sound followed by a high-pitched whistling murmur. As one approaches the sternum from the apex the systolic murmur becomes more rough, blowing, and louder, and a diastolic sound is heard, succeeded by a diastolic murmur; the systolic murmur is louder over the third right rib, and here also a loud diastolic murmur is heard, not as loud as the systolic. To the right of the xiphoid there is a coarse, rough, low pitched systolic murmur. There is some preservation of the systolic sound. There is a distinct pulsation of the vessels of the neck, the jugulars, and the liver.

Liver: Lower border of the right lobe reaches to the upper border of the transverse umbilical line. In the midaxillary line it is thick, not tender, and pulsates strongly, projecting a little farther down than the rest of the liver, and apparently separated to the left by a groove or notch. Beyond this notch toward the umbilicus there is a projecting, somewhat elastic, not tender mass, intimately connected with the liver. Still further to the left and higher up, four and one half inches in a diagonal line from tip of the xiphoid, there is a hard nodule the size of a marble. Below that and a little to the left about one and a half inches is another nodule which is a little smaller. The latter nodule is apparently at the extreme lower border of the liver. About two inches to the left of the xiphoid, beginning a half inch below the margin of the ribs and extending down two inches, is a prominent oval swelling on the surface of the liver, two inches in vertical and three inches in transverse dimensions. The abdomen is as it has been, distended with fluid, the flanks bulging, the veins in lateral walls distended, and the navel projecting.

The pulse is of the Corrigan type. Capillary pulsation shows faintly in the forehead, but not in the lips.

October 1. Urine: Straw color; light flocculent sediment; acid; 1018; no sugar; albumin; amorphous urates; granular casts; leukocytes; epithelial cells.

The autopsy was performed by Dr. Ellis on the day of the boy's death. The pathologic diagnosis was chronic vegetative endocarditis of the mitral, aortic, pulmonary, and tricuspid valves; hypertrophy and dilatation of both ventricles; dilatation of the auricles; congestion of the lungs; adhesive pleuritis of the right side; chronic congestion of the spleen and kidneys; red atrophy of the liver, with serous cysts of the capsule, and beginning cirrhoses; chronic catarrhal gastritis; probably ulceration of the esophagus.

The heart was enormously enlarged. The right side and left

auricle were distended by partly clotted blood. The tricuspid valve showed over practically the entire margin numerous grayish elevations, most of them not over 1 mm. in diameter. The valve was not narrowed. The wall of the right ventricle was 0.9 cm. thick, firm, and red in color. The pulmonary valve had four cusps; the central point of each was thickened, and showed warty elevations. The left auricle was much dilated. The mitral valve was narrowed, the entire margin rough, calcareous, with extensions of the calcareous material to the bases of the leaflets and into the auricular wall for a short distance at two points. On the anterior auricular wall, 4 cm. from the valve, was a patch of calcareous deposit 5 cm. in extent. The wall of the left ventricle was 1.4 cm. thick, rather pale in color, but firm, the muscle columns being stretched. The endocardium, especially below the aorta, was gray and thickened at its margins. The edges of the aortic leaflets were everted, and showed bead-like rows of small fibrous elevations. Two of the leaflets were moderately adherent and contained calcareous deposits.

The liver was large, its capsule being much thickened. On the upper surface of the right lobe were several cysts, translucent, elevated above the surface one or more centimeters, most of them circular and 0.5 cm. in diameter. One was lobulated and 9 cm. in length. They contained a serous fluid, which was occasionally slightly gelatinous in content. The portion of the cyst wall next to the liver was formed by the thickened liver capsule, the cysts apparently being formed in the capsular adhesions.

The patient had a mitral obstruction of long standing, and more recent lesions of all the other valves. The clinical diagnosis was double mitral disease as the chief lesion, with double aortic disease and tricuspid insufficiency. The question of possible pulmonary insufficiency was considered, but the diagnosis was not thought to be justified in the presence of demonstrable aortic insufficiency, which, as is well known, is frequently characterized by a diastolic murmur as well or better heard along the left edge of the sternum from the second to the fourth rib than at the aortic area to the right of the sternum. The age of the patient, however and especially the presence of mitral obstruction as the dominant lesion and the persistence of cough, with marked pulmonary symptoms and cyanosis, deserved greater weight than they received as pointing to the probability of pulmonary insufficiency.

The special signs referred to by Gerhardt and Bamberger were not looked for, their papers not having come to the writer's notice at that time. It is doubtful if Gerhardt's auscultatory signs could have been elicited, for the right pleural sac was obliterated. In my second case they could not be heard, owing both to edema of the chest wall and to the presence of fluid in both pleural sacs.

CASE II.—The second patient was a white woman, aged thirty-six years, who entered the Philadelphia General Hospital November 10, 1912, complaining of cough, dyspnea, and epigastric pain upon coughing. She had first noticed swelling of the ankles seven weeks before admission. The first thing that attracted the patient's attention was pain in the knees; the feet then became so swollen she could not put on shoes for a period of two weeks, during which time she was compelled to go to bed. The swelling rapidly extended up the legs and thighs and the limbs involved became painful. After two weeks she got out of bed, but was compelled to return immediately.

Dyspnea was first noticed two weeks before admission to the hospital. It appeared during the night. The patient states that she was awakened by coughing, and felt as though she were going to choke. She was forced by her condition to leave bed and had to sleep sitting on a chair, with head inclined upon her arms and resting on a table. Up to the time of her admission she had been compelled to sleep in this manner. Cough has been continuous since it began.

The patient's father was living and well. Her mother died at the age of forty-one years. Acute indigestion and "dropsy" are said to have been the cause. Two brothers were living and well. Two sisters are dead, one at the age of eighteen months from "spasms," the other at the age of four years; the cause is said to have been a "heavy cold." One sister was living and well.

The patient does not remember having had the usual diseases of childhood. Had typhoid fever when eleven years of age. She uses alcohol in the form of beer moderately. Uses tea and coffee. Denies the use of drugs. She gives a history of having had a whitish discharge from the vagina which lasted three or four days, and cleared up under treatment by a physician. A burning sensation was noticed upon micturition.

The patient reached puberty at the age of fifteen years. Menstruation has been regular. She has had one child. The delivery was instrumental, and, as she states, resulted in a complete laceration of the perineum, which was repaired immediately after delivery. Child died at age of eighteen months. Cause is said to have been "convulsions and heavy cold."

The patient was a female adult, apparently thirty-five years of age. Skin was moist and cyanotic. Patient had anasarca, but was comparatively comfortable. Respirations were not hurried. Facial expression was one of anxiety.

The head showed no evidence of injury. The ears and nose were normal. There was no ptosis of the eyelids. The conjunctiva was pale. Pupils were equal and regular and reacted to light and distance. Convergence was good.

The lips were cyanotic. They showed no fissures and no herpes.

Buccal mucosa was pale; it showed no ulcerations nor mucous patches. Tongue projected in midline and was slightly coated. Teeth were in very bad state of preservation. Gums were spongy.

Chest: Expansion was poor but equal. Thorax was well developed. No scars, hemorrhagic spots, prominent veins nor abnormal pulsations. Apex beat was visible in fifth left interspace one inch to the left of the midclavicular line. A thrill was elicited upon palpation over the precordium. Fremitus was obtained posteriorly down to the angle of the scapulæ on both sides when in a sitting posture. Anteriorly it was obtained down to the fifth rib on the right side, while on the left it was obtained somewhat lower than this. While in the sitting posture fremitus was lost at least one and a half inches higher on each side than when the patient was lying down. The back of the thorax pitted on pressure. Percussion resonance was obtained down to the areas described above, then the note became dull anteriorly. Posteriorly below scapulæ it was flat. Harsh breath sounds were heard down to the fifth rib anteriorly on the right side. As the fifth rib was approached from the apex, rales were heard on the left side; rales were heard in the axilla as high as the third rib. Posteriorly, rales were heard all over the thorax above the angle of the scapulæ; below this rales were heard with distant breathing.

Heart borders: Second interspace, one inch to the right of the sternum and one inch to the left of the midclavicular line. There was a blowing systolic murmur heard best at the apex and transmitted to the axilla. A presystolic murmur not transmitted was heard a little to the right of the apex. Myocardial sounds poor.

The abdomen was distended. No organ or mass could be palpated through the edematous skin. Fluid was present within the abdomen as well as in its walls.

The extremities were markedly edematous.

Wassermann reaction positive.

The above notes made by the interne at the time of the patient's admission, represent fairly well her condition as it could then be discovered. In a few days, when I saw her, in addition to the usual physical signs of a double mitral lesion—presystolic thrill, short rough presystolic murmur with pronounced systolic sound followed by systolic murmur, accentuation of pulmonic second sound and some enlargement of the right ventricle—the patient exhibited a diastolic murmur best heard along the left edge of the sternum, with maximum intensity at the fourth left interspace. In a week after her admission a double aortic murmur could be heard. As it was not heard on her admission it was believed that an acute process had attacked the aortic leaflets. The pulse was of the Corrigan type, but the arterial signs could not be heard, owing to the edema of legs and arms. So, also, on account of edema of the chest wall and hydrothorax, Gerhardt's chest signs could not

be elicited. The diagnosis was mitral obstruction and insufficiency, aortic insufficiency and obstruction, pulmonary insufficiency. The latter was not regarded as organic but as relative. The autopsy disclosed a lesion of the valve causing insufficiency.

AUTOPSY. By Dr. Ellis. Pathological Diagnosis: Hypertrophy and dilatation of both ventricles; dilatation of both auricles; buttonhole mitral; chronic aortic endocarditis, with superadded acute, vegetative endocarditis; chronic pulmonary endocarditis, with insufficiency; emphysema and edema of lungs; adhesive pleuritis on left side; congestion of spleen; chronic diffuse nephritis; red atrophy of liver; ascites; right hydrothorax; anasarca.

Body of an adult white female. Rigor mortis present. There was an intense subcutaneous edema. Peritoneum contained 300 c.c. of clear fluid. Intestines markedly distended. Left pleura showed universal adhesions. Right pleura contained 500 c.c. of serum. Heart was large; wall of the left ventricle was 1.8 cm. thick. Wall of the right ventricle was 0.7 cm. thick. Muscle was pale but fairly firm. Muscle columns flattened. All four cavities were enlarged. Mitral valve was a quite typical "buttonhole mitral," although margins were not excessively rigid. There was little or no calcareous infiltration. Aortic leaflets were thickened, rounded on margins, contracted, adherent, and rigid. Right leaflet showed in addition a more recent row of vegetations partly organized, nearly the length of "line of contact."

Pulmonary valves showed thickening fibrosis at the base of the left leaflet, with shortening of space between it and the posterior leaflet. Aorta showed moderate atheroma.

Lungs both showed moderate emphysema and extensive edema.

Spleen was large and firm; rich in blood; dark bluish red in color.

Kidneys showed moderately adherent capsules. Slight if any narrowing of cortex.

Stomach showed no gross changes.

Liver was a typical "nutmeg" organ.

Brain showed edema and edema of meninges. Skull thicker than normal.

I have quoted freely from Barié, Pitt, and Gerhardt because they have collected about four-fifths of the reported cases of a rare disease. One who has seen only a few cases must necessarily have an imperfect conception of it. The chief points in the diagnosis of pulmonary insufficiency are its frequent association with mitral obstruction, the diastolic murmur along the left edge of the sternum from the second interspace downward, the occurrence of marked pulmonary symptoms, with cyanosis, and the special phenomena pointed out by Gerhardt and Bamberger.

It is probable that relative pulmonary insufficiency occurs more

frequently then we are wont to believe. Cases have been reported by Graham Steel, Gibson, and more recently by Rudolph.[6]

It seems also to the writer not unlikely that in some of the cases of aortic insufficiency in which the diastolic murmur is heard best in the third and fourth interspace to the left of the sternum that the explanation may be an associated pulmonary insufficiency, usually of relative character.

THE TRAINING OF STUDENTS IN INTERNAL MEDICINE AT GERMAN UNIVERSITIES.

By Professor M. Matthes,

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I have the more willingly availed myself of this opportunity to discuss the teaching of internal medicine in Germany, because I am in a particularly fortunate position to form an opinion on this subject, being able to observe the result of our methods not only from the standpoint of a university professor, but also from that of chief physician for many years to one of the largest hospitals in Germany. In the latter capacity, having maintained close relations with my professional colleagues in active practice, I have become acquainted with both the advantages and disadvantages under which they labor as the result of our modern method of instruction in internal medicine.

The German medical student does not begin his real clinical training until he has studied the preliminary branches during four to five semesters. These preliminary subjects comprise anatomy, physiology, physics, chemistry, zoölogy, and botany. The two last mentioned are regarded more as side studies, and are followed more for the purpose of teaching the student to think biologically than to train him systematically in these sciences. As a preparation for internal medicine, physiology, chemistry, and physics are of most importance.

The instruction in physiology is ample, since under the new requirements a candidate for examination must have had a laboratory course in this subject. On such solid scientific foundation the later pathological instruction can readily be built up. The instruction in chemistry in almost all the universities is in charge of the professor of chemistry of the college faculty, and therefore not in the hands of a medical man. This professor has under his direction the practical course in chemistry for the medical students. The fact that medical students are required to attend the same

[6] Amer. Jour. Med. Sci., September, 1911.

lectures which are given to those studying chemistry as a profession has led to much discussion. Doubtless, instruction in chemistry restricted to subjects of particular importance to the physician would have this advantage: the subjects could be more thoroughly mastered because of their limited scope. This, however, is still a mooted question. For the present it seems advisable that the great questions of chemistry should be taught by a general chemist, rather than by one who is a specialist in only a small portion of this field. The same principle holds true for the instruction in physics. Moreover, at this period of the student's training the phases of chemistry and physics that are medically important are sufficiently emphasized in the courses in physiology. The question arises, however, whether it would not be an advantage to hand over officially to the physiological chemist and physicist at least the practical instruction of medical students in chemistry and physics.

During the fifth semester of this preliminary training, an examination, the so-called *Tentamen Physicum*, is held in these pre-clinical subjects, and not until this is satisfactorily passed can the "candidate in medicine," as the student is now called, be admitted to the clinical lectures; as a rule, therefore, the "candidate in medicine" enters the clinical lecture rooms with a good scientific foundation. This is, indeed, the case with gifted and industrious students. Unfortunately, however, a large portion of the student body on entering the university after the laborious and rigidly prescribed studies of the *Gymnasia* are inclined to enjoy too much academic freedom in the first semesters. Such men may perhaps acquire just sufficient knowledge to pass their examinations, but they do not take up chemistry and physics with the earnestness to be desired. As a result, their instructors in chemistry or physics fail to find in them a proper understanding of these subjects, and this lack of knowledge and interest is the more marked, because the majority of the students still come from "humanistic *Gymnasia*," that is, classical high schools, and begin their medical studies, therefore, with relatively less knowledge of the natural sciences, than do the smaller number of men coming from the more liberal atmosphere of the "*Gymnasia*" or "*Realschulen*." There has been a tendency of late to make the *Tentamen Physicum* so difficult that these deficiencies will be overcome at a time when the whole course of study can be easily changed, and the indolent student thereby prevented from continuing the study of medicine.

Before we take up in detail a description of the course of instruction in internal medicine, it would be well to call attention to the make-up of the teaching staff in the medical department of a German university.[1]

[1] At some of the large universities, such as Berlin and Munich, it has become necessary to have a duplicate teaching staff.

The full professor is the *Ordinarius*. He is head of the department and holds the clinic. The next in rank is the chief of the outpatient department, or *Poliklinik*, and is usually called the *Extraordinarius*, or assistant professor. He is not a voting member of the faculty but is a regularly appointed teacher, and has in most cases his own institute. In addition there are a number of *Privatdozenten*, or associates; out of courtesy the older ones are sometimes referred to by the title professor. They hold assistantships in the clinic or *Poliklinik*. Some of the *Privatdozenten* who fail to advance and so become chiefs of the *Polikliniken*, and who, therefore, no longer retain their positions as assistants to the clinic, sometimes deliver certain minor lectures, but these should not be considered a part of the regular course of instruction Now and then assistants who have not yet become *Privatdozenten* share in the giving of courses.

At this point I desire to call attention to the manner in which university teachers of internal medicine are developed. After the medical course is finished the graduate who intends to devote himself to an academic career begins as an assistant in the clinic, or *Poliklinik*. As competition for these posts is lively, the clinical teacher in charge often requires that before the young physicians receive clinical assistantships they shall fill similar positions in some of the pre-clinical branches. Thus it happens that they spend one or two years acquiring a special training in bacteriology, physiological chemistry, pharmacology, or pathological anatomy. The director of the clinic sees to it that he has among his assistants those who have had previous experience along the different lines of work just mentioned, with the idea that his assistants shall form a homogeneous whole, efficiently trained in all departments.

After an assistant has served, as a rule, three years as such, he becomes on presenting an acceptable scientific thesis a *Privatdozent*, and usually in three or four more years he may receive the title of Professor, provided he has proved his ability both as teacher and research worker. Obviously, it is only possible for a part of the assistants to be advanced to the real teaching positions of chief of the *Poliklinik*, or clinic. Inasmuch as the large municipal hospitals usually select the chief physicians of their internal medical divisions from among the university teachers, a strong stimulus is furnished to those in the subordinate teaching positions to at least win the title of Professor at the university. By this means their chances of becoming chief physicians to the hospitals are considerably increased. It is only recently that physicians who have completed their time as assistants in the hospitals have been considered for the chief positions. This has occurred, though rarely, in hospitals in which facilities are provided for carrying out scientific research studies. As a consequence of this slow development of the university teacher, a full professorship is, as a rule, not reached

until the thirty-fifth to fortieth year, and the position of chief of the *Poliklinik* seldom before the thirty-second year. This system also results in the assistants at the university clinics remaining as such for a considerable number of years, during which time no private practice is carried on. They therefore devote themselves entirely to ward work, scientific research and to teaching. As the position of assistant is generally poorly paid, there must exist a real desire for scientific work in order to endure this long apprenticeship. For this reason we may point with just pride to our assistants, for such a thorough training in internal medicine as is acquired through being an assistant in a clinic for many years is almost unknown in other countries. Of course, a number of physicians in Germany after serving a shorter time as assistants enter practice. The majority of these become general practitioners, or after concluding their interneship become assistants in various specialties. Those, however, who intend later to become university professors or chief physicians to hospitals must, as a rule, serve from seven to twelve years as assistants. It has always seemed to me that the chief advantage of this special training of the internist in Germany lies in this long period of assistantship.

We may now return to the description of the clinical instruction itself. During the first semesters after the preclinical years the student busies himself with the theoretical branches of pathology. He attends lectures on general pathology and on pathological anatomy. Heretofore this instruction was exclusively in the hands of the pathological anatomist, but of late, at a number of universities, the professor of medicine himself gives the lectures on pathological physiology, which must form the foundation of every truly scientific course in internal medicine. The majority of the students attend regularly these non-compulsory lectures, which afford a sure means of showing them that the science of medicine is a biological one, and of training them to think scientifically, thereby guarding them from the tendency later on of falling into mere perfunctory routine methods.

Aside from these theoretical lectures in the first clinical semesters the students attend courses dealing with clinical methods of investigation. These courses, which include methods of physical diagnosis, clinical chemistry, and microscopy, are frequently given by the younger members of the teaching staff, although many professors prefer to give themselves at least the theoretical part of physical diagnosis.

Instruction in the clinic now follows. As the professor of medicine is required to teach special pathology in as systematic and complete a manner as possible, he spends relatively a large amount of time in discussing separate cases. On the other hand the chief of the *Poliklinik*, who is responsible for the daily treatment of a large number of cases, is enabled to emphasize better the conditions

as they are met with in actual practice. This will be discussed in more detail later, because the arrangement of the course brings the student to the clinic before the *Poliklinik*.

Medical clinics in Germany differ according to the individual tastes of the professors in charge. Personally, and I believe the majority of my colleagues, prefer to discuss the individual patient before the clinic and not the disease alone. I lay great stress on teaching my classes to observe. On the other hand, many clinicians believe that the clinic is to be regarded as the place for lectures on special pathology and therapy with demonstration. It is obvious that this second method is only possible when a large amount of clinical material is available, and some are inclined to regard it, in spite of its being more systematic, as the poorer method. To be sure, every effort is made to bring together in the clinic as many cases of a given disease as possible, in order to illustrate the differences in the separate appearances of the disease. It is, however, a good plan to make all possible use of the clinical material at hand for purposes of instruction, even at the cost of systematic procedure, and I believe that this mode of instruction, varied in character as it at times must be, is more stimulating and advantageous to the student.

Fortunately, in Germany at all the universities, even those in small towns, there is a wealth of clinical material that suffices for all the needs of instruction.

At present, therapeutics is taken up in detail at nearly every clinic. The time is past for the treatment of disease to be regarded as of minor importance in clinical instruction.

In the clinic each student is called down on a case at least once to listen to what the professor has to say, and on not less than two occasions he takes actual part in the examination. On coming up for his state examinations the student must bring written proof that he has successfully performed his duties at the clinic. The functions of a *Practicant*,[2] as the student is called when he takes part in examining patients, are the following: As each case is brought before the clinic the clinical teacher calls upon the student and personally discusses the case with him. At the same time the student is questioned so as to bring out his knowledge of the subject. When this is deficient, he is assisted in his answers, rather than overcriticised before his fellows. By this means the instruction takes on a certain personal character. The *Practicant* must then keep the case under observation in the ward, and is charged with writing a record of the case, and, if the case be again brought into the clinic, is required to give information concerning its later

[2] This term is also used in another sense in referring to the young physician who, after completing his medical courses, is serving a prescribed practical year in a hospital (see later).—Translator's note.

course. I permit the *Practicanten*, in addition, once weekly to take part in making rounds in the wards.

In addition to the clinic, a number of special lectures are given. A really systematic lecture on special pathology today scarcely appears in any curriculum, as was formerly the case. Certain limited subjects, as, for example, nervous diseases, diseases of the digestive tract, or circulatory apparatus, are sometimes taught by younger members of the staff. On the other hand, therapeutics and diagnosis are always lectured upon in detail.

Within the province of internal medicine, electrodiagnosis and therapy, Röntgen diagnosis and therapy may be mentioned. Lectures are also given, as a rule, on dietetics, physical therapeutics, especially hydrotherapy, balneology, and balneotherapy. Lectures in pharmacology are given everywhere by a pharmacologist, who is in most cases a full professor, and has under his charge the theoretical and practical side of this branch. The practical application of therapeutics is also described in the clinic.

During the last semesters students attend the *Poliklinik*. The duties of the chief of the *Poliklinik* have been already referred to. His duty is to give those students who have already visited the clinic an insight into actual practice. This is accomplished first by the *Poliklinik* lecture, in which a large number of patients are shown and treated as they would be by a practising physician in his consultation hour. Emphasis is laid especially on the cases with slight ailments, which are not admitted to the hospital. Secondly, there is the *Distriktpoliklinik*. This provides medical attention for the poor as well as for certain citizens who by paying a fixed sum annually are entitled to avail themselves of it. This is the so-called *Kassenpraxis*. The city is divided into districts, and each student is assigned a district in which he must care for the sick. He reports his cases, and the chief of the *Poliklinik* or his assistants exercise a control over his work.

In Germany, during recent years, certain specialties have become separated from internal medicine. In this group pediatrics may first be mentioned. At most of the universities there are separate childrens' clinics, and at some smaller ones, where no pediatric clinic in a separate building is as yet available, there are at least childrens' and babies' wards, which furnish material for a special didactic clinic, entirely separate from the main medical clinic. The examination regulations call for written proof that the student has served as a *Practicant* in a childrens' clinic, this being a reason, if no others existed, for this separate arrangement. Although as professor of internal medicine I hold a clinic on pediatrics, I recognize the special position of this branch, especially as hygiene of the child in its earliest years and the diseases of this period must be dealt with in separate lectures.

In Germany nervous diseases are in part separated from internal

medicine, insofar as at some universities connected with the psychiatric clinics are wards also intended for nervous cases without mental disturbances. These clinics are officially named psychiatric clinics and clinics for nervous diseases. Nervous diseases will indeed continue to be taught in the medical clinics and such cases must be demonstrated. It is not a mistake that nervous cases, especially the functional neuroses, should be shown and demonstrated both by the internist and by the psychiatrist. The student then becomes acquainted with the nervous cases from two different but equally important standpoints, which can only be of advantage.

Furthermore, in Germany there is a growing demand for a separate course of instruction in so-called social medicine, which treats of practice connected with beneficiary societies, corporations, and life as well as accident insurance companies, the legal position of the physician to his practice, and the relations of physicians to each other. The majority of clinical teachers are opposed to making social medicine an independent subject for teaching. I agree with this view. The beneficiary societies and similar institutions are desirous of this step being taken, in the expectation that they will then receive better certificates from the physicians. This is an error. Only he who has learned to make a proper medical examination can write a useful certificate of health. It is the duty of the clinical teacher to point out the importance of and the formalities concerning a certificate of health, as well as to enlighten the students on the highly developed system of beneficiary and insurance bodies which exist in Germany. This he is competent to do, as he has practical experience in such matters.

After following this short description of the instruction in internal medicine at our universities, if one asks, Does it fulfil its purpose? this question unfortunately can only be answered conditionally in the affirmative. Without doubt the course of instruction is of such a character that an industrious student receives a sufficient scientific training. Experience he must acquire later. For this the time, five years, devoted to medical study is too short. There is, however, another reason why the training in internal medicine is rendered difficult. Our students are overworked in their five clinical semesters. They study not only internal medicine, but are also expected to acquire a knowledge of surgery, gynecology, and obstetrics. Not only these but also special subjects are continually being introduced into the regular course of study. Hygiene requires a great deal of time. Diseases of the eye, ear, nose, and throat, as well as psychiatrics, are already subjects upon which the student is examined or is soon likely to be. The same holds true for dermatology, orthopedics, and other subjects. Our students in the clinical semesters are fairly industrious throughout. They attend in Marburg eight to ten lectures daily. This, in my opinion,

is more than the working capacity of a normal brain can endure. The student is scarcely able to do any work at home, and for this reason our university vacations are an absolute necessity, in order to give the student time to study.

The danger is that in the near future the study of internal medicine will be too much limited through the encroachments on both the time and working capacity of the students by the special subjects. For example, it is only possible for comparatively few students to serve in the *Distriktspoliklinik* during the semester. To a certain extent this is offset by the fact that in the last semester many students remain at the university during the vacations, work in the clinic, or *Poliklinik*, and indeed, as so-called under assistants, take part in active hospital service. This is also possible during the semester, but the number of such positions is of course limited.

The administrative authorities have become convinced that the student cannot acquire from his university instruction alone sufficient experience and self-dependence. On this account the so-called practical year has been introduced. This means that every student must serve at an officially recognized institution for the sick after the state examinations have been passed. Not until this practical year has been finished is a license to practice granted. Four months of this year must be given to the medical wards, the remaining time being left free for other branches. The right to accept these *Practicanten* belongs to almost all hospitals, and in part to the sanatoria for tuberculosis and to the insane asylums. The academies for practical medicine in Cologne and in Düsseldorf are considered to have as their special duty the training of *Practicanten*. Unfortunately, the present lack of assistants in Germany, the causes of which I will mention later, has led smaller hospitals, which could not fill their assistantships, to engage *Practicanten* in place of assistants, and, indeed, to give them free lodging and perhaps a salary as well. As a result, these positions are more sought after than those in the great hospitals, which offer no return for services, but much more opportunity to learn. Moreover, as a rule, in these last institutions the staff is composed of physicians better adapted to be teachers.

Recently the attempt was made to do away with this unfavorable state of affairs through suitable regulations. It was suggested that the *Practicant* be put in charge during his practical year of a ward consisting of at least fifteen beds; the assistants or the chief physicians to exercise, however, control over these patients. There is no doubt that the practical year is a valuable institution, although in Germany many contrary opinions in regard to it have been heard.

The practical year has been the cause of at least one unfortunate condition. Young doctors of medicine in the past, after passing their state examinations, usually became the representatives of

physicians who wished, for various reasons, to give up their practices temporarily. It is now difficult for such physicians to find qualified individuals to take over their work. For this fact the practical year is in part responsible. Another reason, however, is that many young physicians after ending their year of practical duty in the hospitals become assistants, and after completing their time of service as such go into practice without being inclined to temporarily care for the practice of another.

We now come to a consideration of the subject of assistantships other than those in the university clinics which have already been described, that is, the positions of assistant to the city and other hospitals. Before the introduction of the practical year it was the custom for young physicians who could in any way afford financially to do so, and were not forced to turn at once to earning a living, to enter upon assistantships of some years' duration in various hospitals. This was done by those who did not find positions in the university clinics. They would, as a rule, spend approximately one year in medical wards and one or more years in the surgical or other divisions. These men who obviously were more experienced than their colleagues, who went directly from the university into practice, later on acquired a practice more rapidly. At present these conditions have become essentially changed. While formerly there was sharp competition for the comparatively few available assistantships, and often the young physicians had to content themselves with unpaid voluntary positions, there is today in Germany a considerable lack of assistants, owing to the rapid development of the hospital system. It should here be noted that hospital assistants carry on no private practice in addition to their hospital service. In almost every town hospitals have been founded, and in the larger cities there are some hospitals with a great number of beds. The beneficiary societies of miners and those in other callings, the life and health insurance corporations, have, in addition, large hospitals and sanatoria for tuberculosis, without mentioning the numerous hospitals founded by religious orders, which are to be met with in the Rhine districts and in Westphalia. All these institutions require medical assistants. Here, too, may be mentioned private institutions which support physicians of reputation. This lack of assistant material has been the cause of the hospital positions being, if not well paid, still better paid than formerly, so that in contra-distinction to the as yet low-salaried university assistantships the young assistant physician in a hospital may be said to receive sufficient income to support him so long as he remains unmarried. While formerly the smaller hospitals supported surgeons as physicians in chief and were preponderately surgical in equipment, there are now being instituted independent divisions for internal medicine.

As a result of these conditions only a small number of the young

medical men go directly into practice. The large majority become assistants, and so complete their training. The positions of chief physician are held for life and are comparatively few in number. The number of assistants naturally far surpasses the number of chiefs. In most cases the assistant period is not to be regarded as a training for the position of chief physician, but is rather to be looked upon as a preparation for active practice, especially as the more important positions of chief physician are usually filled from the ranks of the university teachers.

The young doctor of medicine, after serving on an average of two to three years as an assistant, on entering into practice does not always find there the most pleasant conditions. The medical profession is today overcrowded in Germany. Hence, the average income of the physician is comparatively small and totally inadequate as compared to the length of the training required. For this reason, many practitioners are later forced to become connected with corporations, beneficiary societies, and similar organizations and so earn a certain *pro rata* remuneration, which even if fair, is not, in view of the great numbers of cases that must be seen, conducive to scientific development. If the *Kassenärzt*, as such a physician is named, be placed in the position, as occurs in the industrial districts, of having to treat thirty to forty patients in his office hour, he must sacrifice care and thoroughness of examination in order to accomplish it.

It is recognized that the practice of internal medicine of today, scientifically pursued, demands a number of laboratory examinations for which the busy practioner has neither the facilities nor the time at his disposal. Such examinations can scarcely be properly paid for by the people at large. The attempt of late is being made, at least in the cities, to relieve this unsatisfactory condition by instituting laboratories for this purpose and by having the physicians refer their complicated cases to the hospitals for diagnosis. As the practitioners, earlier in their careers, were usually assistants to the hospitals, they often maintain in this way gratifying connections with hospitals and with scientific medicine. In the country it is difficult to carry out this plan, and I believe this is precisely the reason why physicians of a better class do not willingly take up country practice. Of course, there are many excellent physicians to be found in rural districts who continue to work scientifically, and, because they must be self-reliant, frequently surpass their city colleagues in general medical knowledge.

It is natural that the busy practitioner cannot always follow the rapid progress, which the science of medicine and internal medicine especially is making. A splendid proof of scientific interest is shown by our German physicians who support so well the post-graduate courses, which are held at the universities, academies of medicine, and in the larger hospitals. These courses, which,

as a rule, last some weeks, can only be taken by the practising physician at a considerable cost, which includes loss of practice and paying another for taking over his work, in addition to the sacrifice of time that might otherwise be devoted to vacation. In Cologne, I held such graduate courses for a period of six years, and it was almost always the course in internal medicine which could boast of the best attendance. The average German practitioner possesses a live interest for scientific medicine.

It would seem, therefore, that the training of physicians in the medical science, and especially in internal medicine in Germany, is sufficient to meet all reasonable requirements. There are, of course, physicians of inferior standing in this country who by an effort have been able to pass their examinations and who do not develop later, but fortunately these form a small minority, and rarely advance to good medical positions. The German who today dedicates himself to the study of medicine must have clearly in his mind that he is to lead a life filled with labor; but if he possess ability, a life replete with the labor that breeds contentment, even though it fails to bring with it a large income.

A STUDY OF THE NORMAL COAGULATION OF THE BLOOD, WITH A DESCRIPTION OF THE INSTRUMENT USED.

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This brief study is more of a test for the stability and accuracy of this new instrument than a study of the coagulation time of the blood. We have tried so far as possible to eliminate the intrinsic factors which might affect the blood by choosing normal adult individuals. The intrinsic factors are as follows:

1. Those affecting the blood: (*a*) Viscosity; (*b*) blood pressure; (*c*) leukocytes; (*d*) specific gravity and anemia.

2. Physiologic conditions of the body: (*a*) Age and sex; (*b*) menstruation period; (*c*) time of day; (*d*) diet.

In the testing of any new instrument for the estimation of the coagulation time the extrinsic factors are the important ones to overcome.

The extrinsic factors are as follows: (*a*) Foreign body—dust or dirt; (*b*) area of surface contact; (*c*) air evaporation; (*d*) temperature; (*e*) size and shape of drop; (*f*) mechanical disturbances; (*g*) determination of end point.

We have taken the best parts of the numerous instruments on the market and combined them, thereby obtaining what we think is a simple but reliable instrument. In over three hundred tests we have found the average time to be from three and one-half to five and one-half minutes.

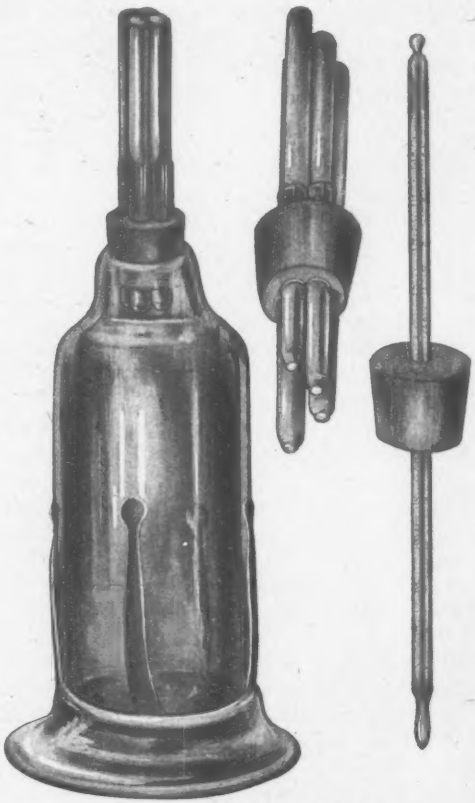

FIG. 1.—Showing various parts of the instrument.

DESCRIPTION OF THE INSTRUMENT (Fig. 1). It consists of an eight-ounce thermos bottle without the silver lining, an aluminum stand, and two rubber corks which fit snugly into the bottle. One cork has a hole in it for a thermometer which registers up to 140° F. The other cork has four openings, each of which is lined with a brass flange. Into each of these openings a glass rod fits. These rods are four and one-half inches long with a diameter of 8 mm. One end is cone-shaped, with a flat tip 4 mm. in diameter. The

other end is slightly bulbous, to prevent the rod from slipping through the flange.

METHOD OF APPLICATION. The thermos bottle is filled with water at 98° F. to within one inch of the top. It is then covered with the cork containing the thermometer to prevent any change in the temperature of the water. The rods within the second cork are first scrubbed with soap and water and then cleansed with alcohol and finally with ether. This cork is then substituted for the one containing the thermometer, so that the rods will become heated to the temperature of the water. This is done while the finger of the patient is being prepared. The rods during the time that they are in the bottle heating up to the temperature of the water will have collected considerable moisture, and it is therefore necessary to wipe them dry before collecting the blood, else the moisture will dilute the drop of blood. The finger is given a good stick, so that it bleeds without pressure. The first drop of blood is wiped off, and as soon as the second drop or whatever drop you are going to use appears. As soon as the drop begins to appear the cork containing the glass rods is removed from the bottle and the rods are wiped dry. Then with care each one of the rods is placed in contact with the drop of blood. If done carefully the same size drop will be taken up by each rod. From the time of the appearance of the drop until the blood is collected and the cork replaced in the bottle should not be more than ten seconds.

The end point with this instrument is determined in three ways: I. In explaining the end results we shall number the glass rods in the order in which the blood was collected upon them. At the end of two and one-half minutes rod No. 1 should be pushed down into the water. It will be noted that all the blood falls off the end of the glass rod and breaks up into a fine cloud. Rod No. 2 is introduced into the water at the end of three and one-half minutes. There will still be considerable falling off of the blood, but when it breaks up the particles will be coarser and there will remain a small amount on the end of the rod. Rod No. 3 is introduced into the water at the end of four minutes. There will still be noted some dropping off of the blood, and there will be found a larger amount of blood adherent to the end of the rod. Rod No. 4 is introduced into the water at the end of four and one-half or five minutes, depending upon the action of the former rods. There will be a slight falling off, but the greater part will be found to be adherent to the end of the rod if coagulation has taken place. The fact that we start at two and one-half minutes from the time of the appearance of the drop is only an arbitrary factor. The test can begin at any time and the rods be introduced at any time that the operator desires.

II. The cork containing the four rods is now removed from the

bottle and held up to the light, with the end on which the blood is adherent nearest to the eye. On looking through the rods the following results will be found: Rod No. 1 will be clear. On Rod No. 2 will be observed a slight reddish tinge. On Rod No. 3 this reddish tinge will be somewhat deeper in color and the end of Rod No. 4 will be almost covered with a red clot.

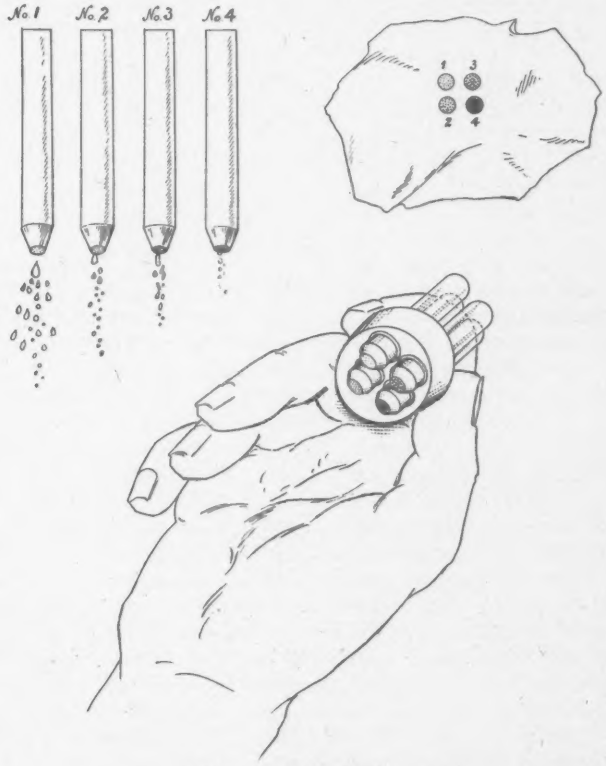

FIG. 2.—Method of application.

III. The end of each rod is blotted with filter paper or blotting paper, as shown in Fig. 2. The blot made by Rod No. 1 will be practically clear. Rod No. 2 will show a slight red color, Rod No. 3 will show a more distinct red, and Rod No. 4 will show a clot. If the last rod does not show the blood to have coagulated the test should be repeated, with the first rod introduced at four minutes and the others at either one-half minute or one-minute interval.

It is a well-established fact that the first drop does not coagulate as rapidly as the later ones, and as we want to know the shortest time we take about the fourth or fifth drop. Blood that is taken from the veins and does not come in contact with the tissue juices does not give the true clinical coagulation time. The tissue juices are one of the most important factors in the causation of coagulation.

An almost complete bibliography and description of the different instruments used for determining the coagulation time can be found in Dr. Myer Solis Cohen's article, "The Coagulation Time of Blood as Affected by Various Conditions."

I am indebted to Dr. Allen J. Smith and to Dr. Ludholts for suggestions and criticisms.

Messrs. Chas. Lentz & Co., Philadelphia, have placed the instrument on the market.

CHRONIC ULCER OF THE PYLORUS (DUODENAL AND GASTRIC) SECONDARY TO APPENDICITIS, COLITIS, BILE-TRACT INFECTION, AND OTHER FOCI OF INFECTION WITHIN THE AREA DRAINED BY THE PORTAL VEIN.[1]

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The history of the modern study of "stomach trouble" may easily be arranged into three periods. It has not been many years since we heard much and long of the stomach specialists. These gentlemen on the medical side were treating the organ with bitter and acrid medicines, dietetic restrictions, the stomach tube, electricity, and other remedies; and certain enthusiastic surgeons were coupling the stomach to the bowel under the mistaken impression that they were diverting an imaginary, harmful digestive fluid from an imaginary sore spot in the region of the pylorus. In reality the "stomach specialist" was often treating an organ guilty only of making known the symptoms referred to it from such lesions as chronic appendicitis, bile-tract infection, pancreatitis, pulmonary, cardiorenal, brain, spinal cord, and other diseases, or presenting only slight pathology, and that of secondary development.

In the second period it was asserted by many that nearly all "stomach troubles" were in reality not stomach diseases at all, but only "reflex symptoms" indicating disease elsewhere. During

[1] Read at the meeting of the Medical Society of Virginia, held at Norfolk, Virginia, October 23, 1912.

this period physicians used pills, sedatives, electricity, and olive oil, and surgeons were uncoupling gastro-enterostomies "done elsewhere" and removing appendices, gallstones, and other "reflex" causes; believing that because certain individuals could swallow nails, lamp-chimneys, knife-blades and other such articles and still have good digestion, that the stomach was almost immune to disease. During this period the stomach was designated by a short and very ugly word; little or no attention being paid to the secondarily produced pathology in the stomach resulting from long-continued disease in correlated organs.

About the year 1910, however, largely through the work of clinical pathologists, and especially of MacCarty, the true condition of affairs became suspected, and the pendulum of judgment began to take its proper position. So that while it is granted that the stomach is often making known the symptoms referred to it from disease in remote areas, yet it becomes the seat of real pathology as a late result, especially of appendicitis, bile-tract disease, and other lesions in the area drained by the portal vein. It is known that in the patient who has persistently impaired gastric function, as shown by delay of digestion, impaired motility, dilatation, and especially diminished hydrochloric acid, with excessive mucus in the gastric contents, the stomach upon examination will show thickening of the mucous membrane, with submucous infiltration and hyperplasia, and this means chronic inflammation.

During the last few years much information has been gained, and if we will acquire, assimilate, and appropriate the knowledge now accessible, most of the problems connected with pyloric ulcer will be advanced toward solution. The significance of clinical experience, corroborated by scientific facts given us by anatomists, physiologists, and a study of living pathology, would cause most of the strange hypotheses, curious fancies, and absurd statements so carefully embalmed and persistently transmitted from one text-book to another, soon to give place to a proper conception of the real cause not only of ulcer, but of a train of allied disorders which for centuries have masqueraded as and finally produced real stomach disease.

The earliest cases of pyloric ulcer discovered upon the operating table were those in which perforation had occurred, producing diffuse peritonitis, and in which the pre-operative diagnosis of acute fulminating appendicitis had been made. A detailed study of the case reports of perforated duodenal and gastric ulcer, operated upon even as recently as three to five years, shows that there was a frequency in this particular error of diagnosis. Gibbon and Stewart,[2] for example, report 22 cases of perforated ulcer operated upon, in 6 (27 per cent.) of which the diagnosis of appendicitis

[2] Transactions of Surgical Section, Amer. Med. Assoc., 1909.

was made before the operation, a "chronically inflamed" appendix removed, and further search revealed perforated duodenal ulcer. The remaining 16 cases were diagnosticated as perforation of the duodenum, and the appendix was not examined. Ellsworth Eliott's cases[3] showed the same tendency to disregard the appendix except when a diagnosis of appendicitis was made. In the olden days even the surgeon's consideration of appendicitis was an acute suppurating organ, with or without peritonitis, and what is now known as chronic appendicitis—namely, obliterated, thickened, kinked, adherent appendices—were often regarded as insignificant. During this time many cases of bile-tract infection, with and without stones, were discovered during the course of operation and at autopsy.

For the past two or three years, however, the journal articles have described, with progressive frequency and lucidity, without, in many cases direct intention of calling attention to etiology, a large number of cases in which associated lesions were found in the pylorus, bile tract, appendix, pancreas, and the area drained by the portal vein. And while associated lesions in this physiologic area are frequent there is a scarcity of incidental lesions elsewhere in the body when studied in comparison. Previous to 1910 figures were comparatively scarce. It is only during recent years that exploration of the abdominal contents to discover lesions other than those for which the incision was made has been carried out; and yet there are mentioned in some contributions instances of association of these lesions found sometimes at the primary operation or more frequently at a second operation or at autopsy.

Thus the Mt. Sinai Hospital report for 1904 shows 7 cases of ulcer operated upon; 3 of these were associated with foci of infection within the area drained by the portal vein, 1 with appendicitis, 1 with bile-tract infection, 1 with "spastic ileus." In January, 1906, Ochsner[4] recorded 4 cases of pyloric ulcer, 2 associated with bile-tract infection, 2 with appendicitis, and 1 case with all three lesions. In February, 1907, Moynihan[5] recorded 15 perforated ulcers; 1 case had incidentally an inflamed prolapsed rectum. In the other cases the appendix and bile tract were not examined. (In patients with pre-operative diagnosis of perforation, exploration is not commonly carried out; the surgeon is too busy saving life, to look for other troubles.) In 1908 Moynihan[6] recorded 205 cases of ulcer, 10 of which (5 per cent.) required bile-tract drainage. Again the appendix was not examined. In 1908 Deaver[7] reported 66 cases of ulcer and its results, in 15 of which (nearly 25 per cent.) the history of dysentery, typhoid fever, appendicitis, and bile-tract disease were elicited or demonstrated. In 1909 Gibbon and

[3] Amer. Jour. Surg., October, 1908; January, 1909.
[4] Annals of Surgery, January, 1906.
[5] Ibid., 1907.
[6] Ibid., June, 1908.
[7] Ibid.

Stewart[8] reported 22 perforated ulcers, 6 of which were diagnosticated before operation as appendicitis and a chronically diseased appendix removed.

In 1910 MacCarty and McGrath[9] from pathologic material derived from operation and autopsy studied the relation of appendicitis to bile-tract disease and gastric and duodenal ulcers. Of 52 cases of ulcer, 26.9 per cent. were associated with chronic appendicitis. Of 175 cases of bile-tract infection, nearly 50 per cent. of the cases were associated with chronic appendicitis. Of 2000 cases of chronic appendicitis operated upon, 8.7 per cent. were found to have in addition, bile tract infection. Three cases of duodenal ulcer were discovered at autopsy after operations for bile-tract infection. These gentlemen "regard the evidence sufficient not to prove, but to stimulate a careful study of the clinical histories, with relation to the possibility that chronic inflammation in the appendix reflexly disturbs the gastro-duodeno-hepatico-pancreatic physiologic system, thereby bringing about conditions whereby such lesions as gastric ulcer, carcinoma, duodenal ulcer, bile-tract infection, and pancreatitis may be indirectly produced."

Deaver recorded, in 1910, from the German Hospital clinic, 4 cases of ulcer, 2 with bile-tract infection. Frazier,[10] in the Episcopal Hospital, 1910, operated upon 5 ulcers, 1 with appendicitis and 1 with bile-tract infection. Ochsner[11] and many others are on record as having operated upon many single cases in which appendicitis, bile-tract infection, and ulcer were all found in the same patient at the same time. Beckman[12] records from the Mayo clinic in July, 1910, 20 cases of ulcer operated upon, and in 3 of these bile-tract drainage was also required. Fenwick, quoted by Wood,[13] in 1910, records 61 cases of ulcer, 9 of which revealed also chronic appendicitis. In Augustana Hospital reports, 1910 and 1911, are recorded 79 cases of ulcer operated upon; 35 (or 44.3 per cent.) of these had also chronic appendicitis; 14 (or 17.7 per cent.) had also bile-tract infection, with or without stones, demanding drainage; 7 (or 8.8 per cent.) had all three lesions together, and required appendectomy, bile-tract drainage, and gastro-enterostomy; 3 cases (or 3.8 per cent.) had also to be operated upon for hemorrhoids, and prolapse of the rectum. Mitchell[14] reports 48 cases of pyloric ulcer operated upon in fourteen months, and 19 of these (or 39.5 per cent.) were associated with chronic appendicitis. MacCarty and McGrath's 52 cases[15] showed 26.9 per cent. associated with chronic appendicitis. Moynihan,[16] in 1910–11, operated upon

[8] Transaction of Surgical Section, Amer. Med. Assoc., 1909.
[9] Annals of Surgery, May, 1910.
[10] Ibid., October, 1911.
[11] Internat. Clinics, July, 1910.
[12] Surg., Gyn., and Obstet., September, 1910.
[13] Ibid.
[14] Annals of Surg., December, 1911.
[15] Ibid., May, 1910
[16] Monograph, Duodenal Ulcer, 1912, 2d edition.

62 cases of ulcer, 6 of which demanded also bile-tract drainage, for infection with or without stones, 25 cases had also chronic appendicitis, 2 cases had appendicitis, bile-tract infection, and ulcer all operated upon at the same time, and one case had also tuberculosis of the bowel. From May, 1910, to December, 1911, 34 cases of ulcer were operated upon by Moynihan, and in 21 also appendectomy was performed for chronic appendicitis. This observer[17] studied 14 consecutive cases of pyloric ulcer, with the view of determining the condition of the appendix, and having an artist make a sketch of the condition of the appendix in each case. In 2 of these cases the patients were so ill that the appendix could not be removed; in all the remaining 12 the appendix was the seat of chronic disease, sufficiently severe to demand its removal independently of gastric ulcer. Moynihan has no hesitancy in stating that he believes that the appendix should be removed in at least 90 per cent. of all cases, and that in 80 per cent. of these it is the seat of long-standing and advanced disease.

Of a total of 332 cases of ulcer operated upon in 1910–11, in 111 (or 33.3 per cent.) there was also chronic appendicitis sufficiently severe as to demand appendectomy; and this proportion, be it remembered, is far below the actual facts, for in comparatively few was the appendix even examined. Pilcher,[18] in 100 cases of histologically proved chronic gastritis, with occult hemorrhage, found 48 with appendicitis; 36 with appendicitis only, and 12 with appendicitis and bile-tract infection combined. Sixty cases had in addition to stomach infection, bile-tract infection, and of these, 32 had gastric and bile-tract infection together, 16 had gastric, bile-tract, and pancreatic infection combined, and 12 had gastric infection, bile-tract infection, and chronic appendicitis. In only 16 was gastric infection alone present.

Considering cases operated upon for bile-tract infection with and without stones the following incidence of ulcer, bile-tract infection, and appendicitis is interesting: In January, 1906, Ochsner[19] reported 13 cases of bile-tract infection, with and without stone, and 4 of these had in addition pyloric ulcer, 7 had appendicitis, 1 case had appendicitis, pyloric ulcer, and bile-tract disease all combined. Of 344 cases of bile-tract disease studied by Stanton[20] in 1911, which had been operated upon eight or nine years previously, it was noted that 9 of these cases had ulcer of the stomach also. In the Augustana Hospital, 1910–11,[21] 141 cases of bile-tract infection were operated upon, 5 of these had in addition ulcer, of these 2 had appendicitis, ulcer, and bile-tract disease combined. Sixty-eight cases (or 48.2 per cent.) showed also chronic appendicitis, 1 case had

[17] Moynihan, Lancet, January 6, 1912.
[18] Jour. Amer. Med. Assoc., November 19, 1910.
[19] Annals of Surgery, January, 1906.
[20] Jour. Amer. Med. Assoc., August 5, 1911.
[21] Augustana Hospital Report, 1910 to 1911.

pancreatitis, and 2 cases had hemorrhoids. According to this incidence, 3.5 per cent. of all cases of bile-tract infection are complicated by ulcer of the stomach.

Considering chronic appendicitis, the Augustana Hospital, 1910–11, reports 514 cases, 7 (or 1.3 per cent.) of which had ulcer of the stomach, 2 of these had ulcer alone and 5 had ulcer and bile-tract infection; 45 cases (or nearly 9 per cent.) had bile-tract infection without ulcer. Fenwick, quoted by Wood,[22] found that in 31 cases of appendicitis, 9 of them, nearly 29 per cent., had pyloric ulcer and of 61 cases of ulcer, 9 (or 14.7 per cent.) were associated with chronic appendicitis, and 3 cases (5 per cent.) with bile-tract infection. There are many single and small groups of cases in literature easily accessible, but the clinical reports of most cases are incomplete. The writer would suggest that the coincidence and relationship of these lesions, one to the other, be more carefully investigated, and that table findings be more fully recorded. Doubtless active surgeons are doing this the world over at the present time, and it is to be hoped that further studies will be rapidly forthcoming. I have observed in my own practice and through the courtesy of several local surgeons during the past year at least a dozen cases in which chronic appendicitis, bile-tract infection, and pyloric ulcer existed in the same patient at the same time. And in conversation with several of my friends I have heard of many more cases. This subject is too large and important to be based only upon "experience," and I shall therefore avoid contamination of facts with deductions founded upon "personal observation." After all, clinical experience, to be of value, must be based upon a large amount of scientifically studied material and unless the clinical deductions can be shown to be in conformity with established facts of physiology, pathology, and anatomy, the experience cannot be productive of positive conculsions.

The association of pyloric ulcer with acute appendicitis and other acute infections of the portal area presents a striking rarity of incidence. Clarence McWilliams[23] reported from the Presbyterian Hospital, New York, 687 cases of acute appendicitis. Of these 68 died and only one showed evidence of ulcer in any part of the bowel. In none of those cases which recovered was there any sign of pyloric ulcer. McWilliams quotes from Schwalbach, who collected 30 cases of gastric and intestinal hemorrhage after operation for appendicitis, and this observer believes that the hemorrhages in these cases were caused by septic thrombi of the omentum and mesentery. Many cases of portal phlebitis complicating acute appendicitis are recorded in literature, but this is indicative only that infection is carried from the appendix by way

[22] Surg., Gyn., and Obst., September, 1910. [23] Annals of Surgery, June, 1910.

of the portal vein. Abscess of the liver, subdiaphragmatic inflammation, and acute bile-tract infection (cholecystitis and cholangitis) are common enough as later developments during the course of acute appendicitis. Duodenitis and gastritis are present in all cases, except those operated upon very early; but chronic ulcer is not to be expected as a result of acute, promptly cured, appendicitis.

As to the coincidence of chronic appendicitis with other lesions within the abdomen, many practitioners believe chronic appendicitis to be such a frequent finding that the thickened, obliterated, or flimsily adherent appendix will be noted with equal frequency if sought for during the course of operations upon other intraperitoneal structures. But the figures and observations of pathologists fail to show anything like the same frequency as is noted in cases of bile-tract disease and pyloric ulcer. Only 17 per cent. of all autopsies and 23.5 per cent. of all abdominal operations including those for lesions of the bile tract, pyloric, etc., show any evidence of disease of the appendix (MacCarty). With right-sided salpingitis we are familiar with the associated appendicitis incident to extension of infection along the appendiculo-ovarian ligament of Clado. In no other pelvic disease, however, is the incidence of appendicitis noted with anything like the frequency as is the case with bile-tract and pyloric infections. Nor is ulcer found with any significant freqnecy. Thus in Augustana Hospital, 1911, of 69 cases of uterine myomata, ulcer was not found in a single case; and appendicitis was found only 19 times. In only 1 of the ulcer cases in the Augustana Hospital was there recorded an apparent lesion in the pelvic organs and this was a case of retrodisplacement of the uterus and chronic appendicitis. Of 1244 myomas operated upon by Mayo,[24] in only 1 was pyloric ulcer recorded, only 92 had gallstones, and in only 686 was the appendix removed. Of 100 women operated upon for gallstones in the gynecologic clinic of John G. Clark,[25] about 70 sought relief for female pelvic disease and 14 for other abdominal lesions, producing symptoms more acutely crippling than those caused by the bile-tract disease.

Sixty-four years ago Curling claimed to have noted the occurrence of ulcer in the duodenum secondary to burns, but there have been suprisingly few of such cases reported in literature. Ulcer following burns is always of acute type, occurs within seven to fourteen days following the burn, and never on the gastric side of the pyloric ring (Murphy).[26] The causative agent in such cases is believed to be irritative toxic material eliminated by the bile. When the abdominal wall is burned, septic material may pass through the vein, passing in the round ligament from the umbilicus to

[24] Surg., Gyn., and Obst., February, 1911.
[25] Jour. Amer. Med. Assoc., November 2, 1912.
[26] Gynecology and Abdominal Surgery, Kelly and Noble

the portal vein and through the liver into the bile and the duodenum. In the cases reported by Roberts[27] of duodenal ulcer coincident with wounds of the urinary bladder, or kidneys, general septic processes and burns, the evidence that chronic ulcer of the duodenum was caused by or even consecutive to wounds and infections of the urinary organs is lacking and the cases too few to attract serious attention even to the incidence. In the case of his own the ulcer was of the chronic type, with indurated margins, and was found at autopsy twenty-six days after a rupture of the bladder, with fracture of the pelvis. No mention is made of the absence of infection in the bile tract or in the area drained by the portal vein. Chronic duodenal ulcer can hardly form in so short a time as twenty-six days. Melchoir[28] reported from literature 9 cases of ulcer found at autopsy in patients who had had amputation performed. He further states that in general autospy findings 0.4 per cent. show ulcer of the pyloric region, whereas in the autopsy findings in cases of death following septic processes in 2.7 per cent. ulcers are found, and following extensive burns 3.3 per cent. of cases at autopsy show duodenal ulcer. These cases are of acute ulcers, and according to the testimony of most observers, acute ulcers do not become chronic.

Apart from the operating-table evidence of the association of chronic appendicitis and bile-tract infection with pyloric ulcer, there are striking clinical features possessed in common by these separate diseases. They all exhibit marked chronicity. We know that chronic appendicitis may exist for many years. The average duration of illness in cases of ulcer operated upon by Mayo[29] has been over twelve years. The symptoms of all three affections exhibit marked tendencies to subside and recur. The clinical findings in the three conditions present such striking similarity that errors in diagnosis are frequent.

The age incidence of the occurrence of appendicitis, bile-tract disease, and pyloric ulcer is exceedingly suggestive. The average age at which patients go to operation for chronic appendicitis is twenty-five years; for pyloric spasm, thirty-four years; for bile-tract disease, with or without stones, thirty-nine years; for duodenal ulcer, forty-one years; for gastric ulcer, forty-eight years (MacCarty and McGrath).

There is evidence from Cannon[30] that whatever may be the remote cause of pyloric spasm the immediate cause of this phenomenon is an irritation of the duodenal side of the pylorus, and clinical evidence is pretty conclusive that this irritation is inflammation.[31] Perhaps the nausea and vomiting so indicative as "reflex" gastric signs of acute appendicitis are expressive of duodenitis and

[27] Annals of Surgery, June, 1908.
[28] Abst. Prog. Med., December, 1911.
[29] Boston Med. and Surg. Jour., April 6, 1911.
[30] Mechanical Factors of Digestion.
[31] I shall in the near future refer to pylorospasm in more detail and more specifically.

its attendant pyloric spasm. This view is in strict conformity to the "law of the intestine," whereby irritation of the bowel causes contraction above the site of irritation. Following the pain as do the gastric symptoms of appendicitis, there is time for the infection and irritative toxic material to pass through the portal vein and liver, to be eliminated by the bile into the proximal duodenum, there to be retained, and cause irritation and inflammation, as a result of the retardation of peristalsis demonstrated by Cannon to follow irritation of the cecum. Surgeons have often noticed the prolonged and pernicious vomiting following delayed appendectomy for this type of appendicitis. It may be that ether and the etherizer are less guilty of causing vomiting than is the disease. Perhaps also the "indigestion" coincident with or antecedent to pain in cases of bile-tract infection, as contrasted to the reverse sequence of symptoms in appendicitis, may be referable to the duodenal catarrh, constituting a part of the pathology of bile-tract infection with or without stone. A single attack of uncomplicated acute appendicitis is too transient in duration to be held responsible for the development of chronic ulcer in a healthy pylorus, though acute duodenitis is frequently and easily recognized.

There are clinical differences, especially in the sex incidence of lesions situated within the portal area, which unless carefully scrutinized may lead to erroneous conclusions. When intelligently analyzed, however, the clinical differences do not antagonize the belief in a common etiology of these lesions, but serve useful purposes in several other directions. For example, pyloric ulcer is found on the table more frequently in men than in women, whereas chronic appendicitis and biliary calculi are more common in women. Appendicitis and bile-tract infection are both more frequent than pyloric ulcer. For acute abdominal diseases, barring gynecologic affections, more males than females are operated upon. In females chronic lesions are found more commonly. Pyloric ulcer, even though chronic, must be more constantly and positively painful and productive of acute indigestion than attenuated chronic infections and gall-bladder calculi.

The same can be said of the sex incidence of bile-tract infection with and without stones. So far as the exciting cause of these two pathologic conditions is concerned, both are dependent upon infection. The more chronic the process the more likely there is to be stone. There may be some anatomic and doubtless there is some physiologic reason why women can tolerate infection sufficiently long to cause gallstones more readily than do men. At any rate, we know that more men than women are operated upon specifically for appendicitis, though the chronic disease is found more frequently in women. More men are operated upon for bile-tract disease without stones, while stones are more frequent in women.

More men than women are operated upon for pyloric ulcer, but there is no reason to believe that the bacteria of the duodenum and bile-tract are more numerous or of greater virulence in men than in women. Perhaps our male intolerance to both pain and infection causes us, by driving us to the table, to secure the preventive treatment of at least gallstones and perhaps of the extension of ulcer or its cause from the duodenal to the gastric side of the pylorus.

Any study based on sex incidence of diseases of the digestive apparatus, save those incident or secondary to pregnancy or lesions of the generative organs, gives little or no information as to the specific primary exciting cause. Men, as compared to women, are notoriously intolerant to pain and to infection. Women have both an inherited and an acquired resistance to infection. Phylogenetically we should expect processes of infection and pain to pursue a more mild clinical course, and be more easily resisted by females than by males. Piersol[32] found that in women the duodenum is distinctly V-shaped in 53 per cent. of cases, and in men it is V-shaped in only 23 per cent. of cases. The pylorus is commonly located at a higher point in men (Mayo).[33] As to whether or not these factors favor the location of infection and ulcer, remains yet to be determined.

There are anatomic conditions which make possible the belief, which I am about to express for perhaps the first time, that ulcer of the gastric side of the pyloric sphincter is perhaps a later development representing an extension of infection, and that perhaps the lesion begins as an inflammatory process on the duodenal side of this sphincter in the part of least defence, the fundus of the pylorus.

Anatomic conditions in women may or may not be less favorable to the development of ulcer on the duodenal side, but infection may occur, and being resisted and its symptoms borne, may progress through the lymphatic vessels in the mucous and submucous coats of the pylorus to the gastric side of the sphincter, where it is found at a later period on the table or at autopsy. This may account for the older figures from autopsy findings, showing greater frequency of gastric than of duodenal ulcer in women than in men, though doubtless, as Mayo suggests, many cases in reality of duodenal ulcer were called gastric on account of failure accurately to locate the ulcer in relation to the pyloric sphincter. This continuity of lymphatic vessels in the mucous and submucous coats of the duodenum and stomach may also account for those ulcers which are continuous across the sphincter on both sides.

The past few years have been productive of a considerable amount of knowledge concerning the physiology of the organs of digestion. Many facts which have been known for a long time concerning the anatomy, especially of the upper part of the digestive

[32] Human Anatomy.

[33] Annals of Surgery, June, 1907.

tube, have been re-impressed upon us and some important additional facts have been brought forth. The interrelation of the various separate portions of the digestive apparatus and the interdependence of function of one part upon other parts, constitutes now an essential part in the comprehension of normal and pathological digestive affairs. Biological considerations harmonize with facts derived from a study of the morphology of the various parts of the digestive apparatus and of the normal function and morbid disturbances of the alimentary tube and its accessory glands.

Carefully collected clinical experience, closely scrutinized in the light of modern knowledge of physiology and form, can clarify and corroborate many hitherto imperfectly comprehended phenomena concerning the interdependence of disease of various parts of the digestive system upon disease in other parts of the same system, and in some cases of parts remote from and of function independent of digestion. It is not sufficient to study isolated individual disease processes, such, for example as gastric ulcer, appendicitis, bile-tract infection, pancreatitis, because we have learned from pathologic research and systematic observation on the operating table and at autopsy that chronic lesions in these parts are frequently associated with some other disease in the same physiologic system, and that many times a group of clinical phenomena will be found upon the table to be dependent upon two or more definite pathologic processes, located in point of distance anywhere from one or more inches to twenty-four feet from each other. A comprehensive study of either the etiology or symptom-complex of gastric and duodenal ulcer implies also a close study of appendicitis, bile-tract infection, pancreatitis, and, incidentally, of the single and entire portions of the whole digestive apparatus. This study must begin with anatomy, including development, form and structure, to be followed by a comprehension of the newer knowledge of physiology, including the chemical and mechanical factors involved, and along the same line must be viewed many facts from many sources concerning the pathology and bacteriology of the entire apparatus in the living.

And, after all, common-sense conclusions must be deduced by the individual himself, guarding carefully against accepting dogmatically the conclusions of other writers and teachers until the details upon which conclusions are based are thoroughly comprehended.

Pilcher,[34] in studying 271 cases of achlorhydria gastrica hæmorrhagica, a complex of gastric symptoms usually described as chronic gastritis accompanied by hemorrhage (generally occult), found that in 100 of these cases the underlying primary lesions were foci of infection within the area drained by the portal vein,

[34] Jour. Amer. Med. Assoc., November 19, 1910.

36 being appendicitis alone, 12 appendicitis and gall-bladder disease together, 16 gall-bladder and pancreatic disease together, and 32 to bile-tract disease alone, and in only 16 was the stomach alone involved. These cases showed invasion of the stomach by bacteria, round-celled infiltration of the mucous and submucous coats, engorgement of the capillaries and small punctate erosions, He considered the *rationale* in the production of this chronic gastritis, inhibition of hydrochloric acid, invasion of the stomach by pathogenic organisms, and superficial ulceration or erosin of the mucosa.

MacCarty[35] has shown that the zone of induration about the ulcerated area is made up of hyperplasia of connective tissue and invasion of leukocytes, and that the raw surface of the ulcer represents the area from which the epithelial tissue has undergone necrosis and been exfoliated. He states that the cause of the initial necrosis of epithelial tissue is unknown. Reasoning from analogy there seems to be no reason for believing that this necrosis should be strikingly different from the necrosis which occurs as a result of inflammation of mucous membrane elsewhere. Certainly, the indurated hyperplasia, with round-celled infiltration about the base of the ulcer, is not unlike the wall of tissue about a tubercle or carbuncle, and the necrosis of the ulcer does not always differ essentially from the area of necrosis in the centre of a tubercle or carbuncle if such a lesion is sectioned and the cut surface washed with a solution of hydrochloric acid or bile and pancreatic juice.

As a matter of fact, the life history of a gastric ulcer may be pretty definitely stated as one first of infection of the mucous membrane, followed by connective-tissue hyperplasia, round-celled infiltration, and that ulceration is central necrosis incident to anemia produced by hyperplasia, infiltration, and thrombosis constituting the pathology of local inflammation. Many contributing factors, however, must be active for this process to become chronic and produce the indurated lesion of chronic ulcer.

The contents of the stomach in a condition of health and especially toward the end, or between the intervals of digestion, is practically free from bacteria. Bacteria, though sometimes present immediately following a meal in the chyme as it leaves the stomach, are found in increasingly large numbers and varieties proceeding downward until the contents of the small intestine are discharged into the cecum. The comparative sterility of the stomach and upper bowel depends upon the conjunction of several factors—namely, hydrochloric acid and other bactericidal substances in the gastric secretion and succus entericus together with the mechanical action of mucus, peristalsis, and the retarding action of one species of bacteria upon another.[36] Even though the stomach

[35] Surg., Gyn., and Obst., May, 1910.
[36] Harris, Jour. Amer. Med. Assoc., October 12, 1912.

contains a few organisms immediately following deglutition, cleanliness of the mouth, nose, and throat, and feeding of sterile food, will result in a few days in the disappearance of organisms from the gastric contents. And yet even though the stomach be free from pathogenic bacteria in a condition of health, the lower bowel contains myriads of them. The lower ileum and cecum therefore are the sites of habitat for intestinal flora, and the healthy stomach and upper bowel accommodate bacteria only as transient guests. They can never be made to disappear from the lower ileum and cecum. Peristalsis (Katastalsis) from above and antiperistalsis (anastalsis) from below bring bacteria from the entire digestive tube to the cecum. This structure and its attached appendix may quite appropriately be designated the cesspool of the bowel.

In normal healthy adults investigation has shown that in a large proportion of cases the bile is free from bacteria. But in patients who have disturbances present, or in patients who have had typhoid fever, dysentery, or long-continued constipation the bile always contains bacteria.[37] So that we must remember that the cecum and ileum always contain bacteria, and in patients who have had intestinal disturbance the bile also contains organisms. The gall-bladder may also quite appropriately be designated the cesspool of the liver. While the bactericidal properties of the normal stomach prevent most organisms from gaining entrance to the bowel from this source, typhoid bacilli, tubercle bacilli, and certain other specific organisms when ingested in large numbers into the stomach of individuals impoverished by gastric or systemic intolerance may pass the pylorus. Yet from the cecum through the portal vein and liver they readily enter the duodenum by way of the bile. We have long ago learned that bile is not an antiseptic, but is actually a good culture medium. Conradi, quoted by McWilliams,[38] shows that bile is not only a good culture medium, but believes that when added to blood serum, bile salts form a fixed combination with the opsonins and promptly destroy the bactericidal properties of the blood serum.

The normal living epithelial lining of the intestinal tube resists the passage of bacteria, but this bactericidal property is not possessed by the secretions and extracts of the epithelial cells,[39] and areas from which the epithelium has been eroded by inflammation, afford points of easy entrance of bacteria into the radicles of the portal vein. Once within the blood current pathogenic organims cause lesions anywhere along the course of distribution of the vessels.

Lewis and Rosenow[40] collected 68 cases of portal thrombosis; 9 were secondary to bile-tract infection, 6 to cancer of the bile

[37] Holmes, New York Med. Jour., August 12, 1911.
[38] Annals of Surgery, February, 1911. [39] Schultz, Abst. Prog. Med., December, 1910.
[40] Archives of Internal Med., April. 1 09.

tract, 10 to pancreatic disease, 6 to gangrenous appendix, 6 to infection of the spleen, 1 to infection of the umbilical vein, 1 to inflammatory pelvic disease, and in 3 cases the cause was unknown.

Post-typhoid, appendicular, and amebic abscesses of the liver are well-known examples of portal-vein transmission of infection. J. F. Percy[41] reported a case of recurrent pyloric ulcer which he belived was due to the persistence of a focus of infection within the gall-bladder, and he suggests that a large majority of cases of ulcer have a history of bile tract infection.

A study of convalescent typhoid carriers made by Gould and Qualls[42] represent that of 6709 cases of typhoid fever, 4.6 per cent. continued to excrete typhoid bacilli for over ten weeks after recovery. Of 431 typhoid carriers, 211 were temporary and 221 were chronic carriers, and in 12 per cent. of the chronic carriers, cholecystitis is present. The temporary carriers are mostly young people, while the chronic carriers are old, middle-aged, and sickly people. This shows that the excretion of the typhoid bacilli may be intermittent, occurring mostly in women, and may last as long as twenty-seven years. Autopsy as well as clinical studies show that the gall-bladder is the breeding-place.

It has been shown by MacLaughlin[43] that the organisms of cholera may be similarly carried as in the case of typhoid fever, though for a shorter time. The excretion of cholera vibrio is also intermittent, and 10 per cent. of all cholera carriers show the organisms in the bile tract.

Crowe[44] long ago showed that after the administration of hexamethylenamin, formaldehyde could be easily and quickly demonstrated in the bile.

Hartwell and Hoguet,[45] in working on the subject of experimental intestinal obstruction to determine the cause of death, showed that if the dogs lived after experimental intestinal occulsion as long as one hundred days (one case even after fifty-six days) the duodenum showed edema and inflammatory exudation, exfoliation and formation of acute ulcers. If the dogs had been starved seventy-two hours before the operation, ulcer would not be found, even though some of the dogs lived as long as nine days. These results apply to operations high in the intestine. When the operations are so performed as to occlude and hold in a loop the gastric duodenal and pancreatic secretions, invariably the ulcers were found; if, however, the duodenum were anastomosed low down in the bowel so as to give free drainage, ulcers did not occur, and ligation of the pylorus above the common duct, in no case, is ever followed

[41] Jour. Amer. Med. Assoc., April 9, 1910.
[42] Ibid., February 24, 1912.
[43] Boston Med. and Surg. Jour., October 12, 1911.
[44] Johns Hopkins Hospital Bulletin, 1908; September, 1912.
[45] Amer. Jour. Med. Sci., March, 1912.

by ulcer formation. These experiments, apart from the purpose in studying the cause of death after intestinal obstruction show that the cause of duodenal inflammation and ulceration, is to be found in the microörganisms which are discharged into the duodenum through the bile tract.

Harvey Stone's work,[46] yet to be published, shows even more positively that the bile is a means of transmission of bacteria to the duodenum.

Regardless therefore of the cause of death following intestinal obstruction, these investigations show conclusively that even after ligation of the pylorus, bacteria from an occluded focus of infection in the lower bowel are carried through the liver and eliminated into the duodenum in the bile. Further, it is shown that bacteria cause inflammation followed by ulceration.

In his Mütter lecture, the late A. O. J. Kelly[47] cited in detail sufficient evidence to show that ascent of infection from the duodenum to the bile tract through the lumen of the duct was imaginable, but that it does not actually occur. It is hard to believe that bacteria from the duodenum are sufficiently vigorous to pass through the minute orifice of the common bile and pancreatic ducts against a stream of bile under a pressure of at least 700 millimeters of water, and then with sufficient intelligence and motive to turn almost invariably to the left and proceed vertically upward in the common duct instead of to the right and horizontally into the pancreatic duct against considerably less pressure and volume of fluid. The fact that bacteria are found in larger numbers near the duodenal end of the duct than at higher points is not proof that they enter from the duodenum. The sphincter about the duodenal orifice of the common duct acts in a manner not unlike that of a dam or jetty in a stream of water; filth and solid particles of all kinds in such a stream tend to accumulate above an obstruction. The fact also that the bacteria in the lower end of the common duct are found in greater numbers than in the gall-bladder fails also to prove that they are actually present in greater numbers. On account of the greater quantity of fluid bile in the gall-bladder the bacteria are in greater dilution than in the common duct, and we would expect to find relatively fewer bacteria in a given quantity of gall-bladder contents examined than would be found in a similar quantity of the contents of the common duct.

Small particles of indigo coloring matter placed in the rectum have been recovered from the higher portions of the small intestine. Bond[48] has apparently demonstrated that small particles may be conveyed along a mucous canal in a direction reverse to that of the normal contents of the tube, provided that the tube be suffi-

[46] Medical Society of Virginia, 1912.

[47] Amer. Jour. Med. Sci., September, 1906.

[48] Quoted by Kelly, loc. cit.

ciently nearly empty as to permit partial or complete apposition of its walls. It is doubtful if the gall-bladder and common duct are ever under any circumstances sufficiently nearly empty as to permit apposition of its walls. On the contrary, the bile tract has no adequate expulsive mechanism other than the pressure caused by the volume of its contained bile, and this must amount to 700 millimeters of water to overcome the resistance offered by the sphincter about the orifice of the common duct. Indeed, this overdistention is believed to be the cause of the formation of that diverticulum of the common duct which we have designated gall-bladder. Anatomists dispute the presence of muscular tissue in this structure and no one has ever seen the gall-bladder exhibit muscular contraction. As a matter of fact there is sufficient experimental evidence from many sources that ascending infection in the sense of transmission of infection, along the lumen of any canal against the current of the physiologic excretion, does not occur. The experiments in this line have been carried out chiefly with reference to the urinary organs, though the deductions have general application.

Many cases of pancreatitis, acute and chronic, are associated with pyloric ulcer, and this has contributed to the belief formerly held by many, that infections of the pancreas were commonly the result of ascending infection from the duodenum to the pancreas by way of the pancreatic duct. Since pancreatic infection has been recognized as secondary to bile-tract infection, and since as we are about to recognize that duodenal infection is also a result of the infection in filthy bile, there is ample reason to acknowledge the justifiable association of pancreatitis and pyloric (duodenal) ulcer. Many cases of inflammation in and about the head of the pancreas are believed, upon the basis of recent studies of the lymphatics in this region, to be in reality peripancreatic lymphangitis rather than true pancreatitis. There can be no question, however, that the substance of the gland does actually become infected through regurgitation of infected bile upon the pancreatic duct when the duodenal end of the common duct is blocked by gall-stone impaction, in a manner identical with the development of liver abscess upon common-duct impaction. This is not ascending infection, but retention of infection.

There are even yet a few who seem to believe that infection may be conveyed to an organ from remote sources through the lymphatics. So far as I can learn no one has demonstrated the occurrence of backward flow in lymph channels, and unless this can happen extension to an organ of infection through lymph vessels is an anatomic impossiblity. Lymphatics lead from and not into organs. The lacteals from the bowel certainly absorb and transmit food, filth, and other substances to the mesenteric lymph node filters, from which the venous radicles in and about these structures

rapidly convey to the liver the food for further assimilation and the infection and filth for destruction. It is true that lymphatic vessels in the immediate vicinity of the pylorus, under surface of the liver, and pancreas by their generous anastomosis perhaps permit of mixing of lymph from one area with that from another area. Thus peripancreatitis, perihepatitis, and periduodenitis may arise. But the lymph current is always from the interior of every organ to the thoracic and right lymphatic ducts which empty into the subclavian veins.

With reference to transmission of infection from the duodenum to the bile tract we must remember that, save when diseased, the duodenum is not the habitat of bacteria, and even when in rare cases a few may be found, they are regarded as transients on a rapid journey to the cecum. On the other hand, when the duodenum is infected the bacteria are abundant, and the belief of all observers, and the bacteriologic observations of Pilcher[49] indicate that duodenal infection is generally secondary to foci of infection in the bile tract or bowel. In reality the liver is a vital repository for food and filth brought from the entire bowel by the portal vein, the food to be prepared for assimilation and appropriation by the economy, and the filth to be filtered and partially or completely destroyed. The residue mixed with certain specific substances perhaps manufactured in the liver, drains through a system of sewers, the bile tract, into the bowel, there to serve purposes doubtless useful to the economy, though when virulently or constantly polluted, to spread and under certain circumatances to plant infection. Thus is established a vicious circle made of links of infection difficult to destroy. And even though many partially or completely obliterated appendices are found upon examination to be at the moment free from bacteria, it will scarcely be questioned that through the areas from which the bactericidal epithelium has been eroded, bacteria and poisons from the cecum may enter the portal radicles, and that the ileocecal stasis incident to the irritation of the diseased appendix is favorable to absorption of filthy bowel contents.

"Oral sepsis" has been assigned as the source of infection for gastric ulcer. Türck[50] after feeding dogs for three or four months on large doses of filth made up of boullion and culture of colon bacilli, succeeded in producing acute ulcer of the stomach and the duodenum, but upon a cessation of the feeding the ulcers healed. Feeding in somewhat smaller quantities and over a long time, he succeeded in producing an ulcer which resembled the chronic ulcer in man, but was in reality somewhat different in pathology.

This seems to be the nearest approach to chronic ulcer ever produced experimentally. And the nearest clinical approach to

[49] Loc. cit. [50] Abst. Prog. Med., December, 1910.

this experimental cause to be found in the human being is perhaps the constant feeding through the bile tract of colon bacilli and other pathogenic bacteria from a focus of chronic recurrent infection in the area of bowel drained by the portal vein. Such individuals may be as dangerous to themselves as are chronic typhoid carriers to the community.

Not only is infection more constantly and in more virulent form and larger dosage brought from foci within the portal area to be deposited into the proximal duodenum or fundus of the pylorus by the bile, but the virulence of the bacteria fails to be attenuated by hydrochloric acid, as they would be if swallowed, and the delayed and enfeebled peristalsis incident to irritative inflammatory lesions low down in the bowel, favors retention in the duodenal part of the pyloric region (another cesspool) and delays the discharge of bactericidal acid from the stomach (Cannon). Thus proximal duodenitis (pyloritis) results, causing immediate pyloric spasm, and the process of inflammatory ulceration is begun. Such a route of infection, from bowel sepsis, seems at least more reasonable and clinical than the belief held by many of ulcer secondary to the oral sepsis incident to decayed teeth, tonsillitis, gingivitis, and the like.

There are several important considerations with reference to the anatomy and physiology of the stomach and duodenum in relation to ulcer. The point of the duodenum above the common duct—namely, about the first four inches—is in reality a part of the stomach, and should so be considered. This part of the alimentary tube together with the stomach proper is derived from the foregut; has the same blood supply as the rest of the stomach—namely, through the celiac axis; the same nerve supply through the pneumogastrics and sympathetics, and the same lymphatic drainage. Its mucous membrane is thin and granular, it contains no valvulæ conniventes, and does contain Brunner's glands, which are identical in structure with the hydrochloric-acid glands of the stomach. Its functions and diseases are those of the pyloric region of the stomach. The proximal duodenum does not exhibit peristalsis, and in this respect is like the cardiac end of the stomach. Like the cardiac end also it serves as a mixing chamber for the food and digestive secretions. It is acted upon by respiratory movements of the diaphragm through the liver, and like the cardiac fundus has muscular tone of its own.

A new nomenclature might designate various parts of the stomach as follows: It is divided into two parts, the left or cardiac portion and the right or pyloric portion, by a line passing from the incisura angularis on the lesser curvature to a point opposite on the greater curvature. The cardiac portion would then be subdivided into the cardiac fundus, sac, or chamber, and the body of the stomach; and the pyloric portion would be subdivided into the pyloric ves-

tibule, pyloric canal, and pyloric fundus, sac, or chamber, at present desingated as the proximal duodenum (Mayo).[51]

The fundus and body of the stomach are supplied by the gastric and splenic arteries, while the whole pyloric portion, including the pyloric chamber down to the common duct, is supplied by the hepatic artery through its pyloric and gastroduodenal branches. The small intestine beyond the common duct gets all of its blood supply through the superior mesenteric arteries, and even the inferior pancreaticoduodenal branches of this vessel does not supply any part above the common duct. The veins all empty into the portal.

The entire pylorus and duodenum when considered together are arranged grossly in the shape of an "S" placed transversely. This shape is comparable with that of the S-trap employed by plumbers, and allows the acid chyme, bile, and pancreatic fluid to accumulate in the pylorus between the sphincter muscle and the common duct. That accumulation actually occurs is shown by the fact that this part of the pylorus is always stained with bile after death, and in comparison with the remaining part of the small intestines is much dilated. *X*-ray pictures taken after administration of bismuth show an accumulation of bismuth in this part of the "pyloric cap." The S-shaped arrangement also prevents regurgitation of gas and fluid from the small intestine into the stomach.

The upper margin of the entire stomach along the lesser curvature and for two inches beyond the pyloric sphincter is suspended from the liver by the gastrohepatic omentum (the free edge of which is called the duodenohepatic ligament), and allows free mobility of the stomach and proximal duodenum. Beyond the duodenohepatic ligament, and especially beyond the opening of the common duct, the duodenum is securely fixed in position, behind the peritoneum.

Chronic ulcers of the pyloric region are found just twice as commonly in that portion just distal to the pyloric sphincter as they are in the part of the stomach on the proximal side of the sphincter. In 621 cases Mayo[52] found 64.5 per cent. on the duodenal side and 32.5 per cent. on the gastric side of the pyloric sphincter; 3 per cent. were found on both sides. Seventy-five per cent. of his cases occurred in men. By all odds the greatest number (90 per cent.) of ulcers are found in the first two inches of the duodenal portion of the pylorus, and there are definite anatomic reasons why this should be so. This location corresponds to the highest point of the pyloric region, the fundus. The fundus of all organs is generally deficient in blood supply as compared to other parts of the organ.

[51] Surg., Gyn., and Obst., June, 1908. [52] Loc. cit.

Witness for example the gall-bladder, the urinary bladder, the uterus, and even the fundus of the cardiac end of the stomach. Mayo's anemic spot[53] is located in the fundus of the pylorus, and Wilkie,[54] from a study of 40 specimens, with reference to the arterial supply of the pyloric area, found the first two inches of the duodenal portion of the pylorus markedly deficient in blood supply as compared with the rest of the region. This first two inches is supplied by the supraduodenal artery, which, though usually a branch of the gastroduodenal, sometimes arises from the hepatic and other arteries in the neighborhood. The anastomosis of the supraduodenal with the surrounding arteries is imperfect, and often the supraduodenal is a true end artery with no anastomosis. The first two inches of the duodenal portion of the pylorus is therefore designated as the critical area on account of its deficiency of blood supply and its well-known common seat for ulcer formation. The dome of this region is commonly the point affected, and the dome of all hollow organs is relatively poorly supplied with blood. The slight local anemia incident to vascular sclerosis may account for the greater tendency to ulcer in men as compared to women. Ulcer is in reality local circumscribed gangrene, and men are more frequently the victims of gangrene than are women, though no more commonly the soil for infection.

Moreover, the first two inches of the pyloric part of the proximal duodenum is freely movable, whereas the area beyond is comparatively fixed. It therefore represents the junction of a fixed and movable portion. The tendency for infection to be located at such a junction is strikingly manifested by the localization of tuberculosis of the spine at the dorsolumbar junction. Moreover, in the pylorus this area represents the junction of two curves—namely, the ascending and the descending portions of the proximal duodenum. The tendency for localization of tuberculosis of the spine at the meeting-place of two curves is also conspicuous, and this tendency is exhibited by other structures throughout the body.

Finally, with some reservation, I would submit for discussion the following opinion:

1. The actual pathology of pyloric ulcer is that of central necrosis of an area of inflammation, the necrosis resulting from capillary and arterial blocking by hyperplastic connective tissue and inflammatory exudate.

2. The exciting cause of the inflammation causing the necrosis is bacterial infection.

3. The original source of the bacteria is from some focus of inflammation in that part of the body drained by the portal vein—

[53] Loc. cit.

[54] Wilkie, Surg., Gyn., and Obst., October, 1911.

namely, the small intestine, appendix, cecum, colon, sigmoid, upper part of the rectum, liver, bile tract, pancreas, and finally the stomach itself.

4. The bacteria are carried to the liver through the portal vein.

5. The bacteria are eliminated in the bile after being filtered through the liver.

6. The infection is deposited by the bile into the proximal duodenum or according to the new nomenclature, pyloric fundus, sac, or chamber.

7. The clinical phenomena of pyloric spasm are dependent upon the pathology of duodenal pyloritis.

8. Pyloritis, pyloric ulcer, bile-tract infection, pancreatitis, and perhaps cirrhosis of the liver are late results of infection primarily located most commonly in the appendix, though in many cases in some other region drained by the portal vein; and these lesions frequently exist together in the same patient at the same time or may follow each other in rapid or slow succession.

9. That the cause of pyloric ulcer (inflammation) is probably always primarily located on the duodenal side, and that so-called gastric ulcers are a result of extension of infection from the duodenal, through the lymph vessels in the wall of the pylorus to the gastric side.

REVIEWS

A MANUAL OF SURGICAL TREATMENT. By SIR W. WATSON CHEYNE, Bart., C.B., D.Sc., LL.D., F.R.C.S., F.R.S., Hon. Surgeon in Ordinary to H. M. the King, Senior Surgeon to King's College Hospital; and F. F. BURGHARD, M.S. (Lond.), F.R.C.S., Surgeon to King's College Hospital, and Senior Surgeon to The Children's Hospital, Paddington Green. New edition, entirely revised and largely rewritten with the assistance of T. P. LEGG, M.S. (Lond.), F.R.C.S., Surgeon to the Royal Free Hospital, Assistant Surgeon to King's College Hospital; and ARTHUR EDMUNDS, M.S. (Lond.), F.R.C.S., Surgeon to the Great Northern Central Hospital, and Surgeon to Out-Patients, The Children's Hospital, Paddington Green. In five volumes. Vol. III, pp. 575, 271 illustrations; Vol. IV, pp. 622, 208 illustrations. Philadelphia and New York: Lea & Febiger, 1913.

THE first and second volumes of this revised edition of Cheyne and Burghard's popular *Manual of Surgical Treatment* were reviewed in the pages of this JOURNAL in November, 1912. The third and fourth volumes appeared early in the present year. They include the treatment of surgical affections of the joints, head, face, and spine (Vol. III), and of the tongue, mouth, pharynx, esophagus, stomach, intestines, rectum, and anus (Vol. IV).

The section of Volume III dealing with affections of the joints covers first injuries, which includes dislocations and wounds, and secondly joint diseases. The first chapter in the latter section includes acute inflammation (acute synovitis, acute suppurative arthritis, gonococcal arthritis, pneumococcal arthritis, etc.), and chronic inflammation (chronic synovitis (*a*) with effusion, and (*b*) with synovial thickening); then follow separate chapters on tuberculosis and syphilis of joints, nervous affections of joints, rheumatoid arthritis, loose bodies in joints, and ankylosis. This skilfully evades the vexed question of the classification of some of the latter affections. Most of the subjects are discussed in sufficient detail, and the treatment recommended is that which experience has proved the best; but in the case of suppurative arthritis it surely would have been well to include among recognized methods of treatment weight extension, as well perhaps as formalin-glycerin injections. In the treatment of Charcot joints the authors recommend arthrotomy and drainage in the early stages, to be followed by the use of a brace until death. Excision is condemned.

Under the heading Acute Rheumatoid Arthritis they discuss with somewhat excessive brevity the affection now commonly known as atrophic arthritis; and as Chronic or Monarticular Rheumatoid Arthritis or Osteo-arthritis a fairly satisfactory account is given of what is generally called hypertrophic arthritis. When the latter affects the hip they rightly say that excision is of no use, "giving extremely bad functional result," but they seem not to be familiar with Albee's method of arthrodesis, as they probably would approve it if they ever heard of it, since they commend excision of the knee because it produces ankylosis.

The general subject of ankylosis is discussed in three pages, and a cursory description is given of arthroplasty, with illustrations of Murphy's operation on the hip; but the authors seem to have no personal familiarity with the method as applied to any joint. Then follow chapters on affections of special joints. A curious contradiction is found in the chapter on tuberculosis of the hip-joint: the authors state that the disease is practically never cured, and warn against any active interference even after many years of apparent recovery (p. 127), yet at p. 180 advise arthroplasty "when the disease has passed off completely," whatever that phrase may mean. In spite of this advice, which seems injudiciously radical, there is no mention of Albee's operation for ankylosing the spine, which though radical in one sense is in another sense most truly conservative, because the best and surest "cure" for tuberculous arthritis anywhere in the body is the occurrence of bony ankylosis.

The remainder of the volume, devoted to the surgery of the head and face, calls for no special comment. The various operations (brain, cranial nerves, face, palate, lips, etc.) are adequately described and illustrated by excellent figures.

Volume IV covers the treatment of the alimentary canal from mouth to anus. In treating fractures of the mandible the usual modern preference is given to dental appliances, the authors especially commending Hammond's interdental wire splint, which should be applied (under a general anesthetic) by a competent dentist. Lilienthal's operation for ankylosis of the mandible is better than the methods here described for this serious condition.

In discussing tumors of the jaws, the advice is given to enucleate the eye at once whenever the orbital plate has to be removed in excision of the upper jaw, even if the eye is not diseased, because they consider that the disability from the diplopia which may result if the eye remains is so great as to demand this treatment subsequently in all cases. In connection with various operations on the mouth Dr. Silk describes venous anesthesia, and the method of intratracheal insufflation, whose introduction he attributes to "Metzler" of the Rockefeller "Institution," but with which none of the various authors appears to have any personal familiarity.

Cheyne and Burghard prefer to give the anesthetic through a laryngotomy opening.

In operations for carcinoma of the tongue it is recommended that the lymphatics and the tongue be removed at the same time unless the wounds will have to be made to communicate; in the latter case they think the lymph nodes should be removed first.

Discussing the treatment of wounds of the stomach they urge mopping out the abdomen and then irrigation to remove the extravasated gastric contents, and evisceration if there are foreign bodies (pieces of potato, etc.) in the abdominal cavity. It seems questionable, however, whether such prolongation of the operation does not do more harm than allowing food particles, which after all have been sterilized by cooking, to remain. Likewise, in the operation for intestinal obstruction they advise allowing the prolapse of all bowels which tend to prolapse, so soon as the abdomen is opened. "It is becoming a favorite practice," they add, "to receive the protruded coils into hot cloths smeared with sterilized vaseline or pure paraffin in order to avoid damage to the epithelial coat;" and they speak favorably of the use of a glass tube to evacuate the distended bowels by the method of Monks (pushing coil after coil over the glass tube). The former practice seems less calculated to prevent injury to the serous coat of the bowels than the method of keeping them all in the abdomen whenever possible (and it is usually possible), and the plan of Monks, though seductive in theory and attractive in half-tone illustrations, has not much to commend it in actual practice.

The concluding portions of the volume, which deal with ulcers and tumors of the gastro-intestinal tract, with hernia, and with appendicitis, are well presented and freely illustrated. Even though English surgeons have at last adopted American indications for operation in cases of appendicitis, it is strange that they have still so much to learn from this side of the water in regard to the technique of the operation.

The fifth and last volume, which should shortly make its appearance, is to contain the surgery of the upper abdomen and genito-urinary surgery, as well as that of the neck, the thorax, and the breast.

A. P. C. A.

THE NARCOTIC DRUG DISEASES AND ALLIED AILMENTS. By GEORGE E. PETTEY, M.D., Member of the American Society for the Study of Alcoholic and Narcotic Diseases, of the American Medical Association, etc. Pp. 516. Philadelphia: F. A. Davis Company, 1913.

THIS volume contains 26 chapters of which 20 including quotations are devoted to morphinism. The author deprecates the word

"morphinism" and prefers that of "narcotic addiction," which should meet with general approval. Further, he considers it a disease and not a habit, a toxemia of drug, auto, and intestinal origin belonging to the field of medicine and not neurology. The use or rather the misuse of the hypodermic syringe is held responsible for the alarming increase of cases of morphine addiction in the last forty years. At this point may be mentioned a valuable practical fact evolved from the experience of the author that "in the average Caucasian, thirty days daily use of morphine is enough to establish the 'addiction' to such a degree that very few persons would be able to extricate themselves from it by their own efforts."

Consistently with his belief that the disease is purely and solely a toxemia, he claims that if every cell and structure of the patient's body can be freed from toxic matter there will be no nervous manifestation or suffering incident to the withdrawal of the narcotic. The successive doses of the drug imperfectly eliminated, tend each time to promote its accumulation in the tissues. To the drug, however, are added other waste products whose elimination is suppressed by its presence and to these more than to the narcotic itself the author assigns the symptoms and complications met on its withdrawal, these symptoms being held in abeyance during its administration. Elimination is therefore the keynote of treatment. To this end the bowels and kidneys are availed of, the former with a view more especially to promoting biliary secretion and relieving portal congestion. The administration of purgatives is, moreover, preceded by full doses of strychnin to stimulate the unstriated muscular fibers of the intestine before the centres governing voluntary motion are materially affected. Calomel, cascara, rhubarb, and castor oil as determined by circumstances are purgatives mentioned as meeting the indication, but calomel especially.

The author does not approve of the gradual withdrawal of the drug, saying that "it is as unreasonable and unscientific as unsuccessful." On the other hand he says also the abrupt withdrawal of an opiate from a person addicted to its use without preparing his system for it is not only dangerous to life but it is barbarous. This statement seems somewhat contradictory, but he says also that such danger is, however, obviated if a proper course of preparatory treatment is carried out, namely the eliminative and the "cleansing" treatment above referred to. The purgative treatment is started about 4 P. M. and the last dose given at about 10 P.M. At first the opiate is kept up in the usual doses but none given after 8 or 10 P.M., until after the bowels are moved the following morning. It is again briefly returned to under certain conditions, in much smaller doses which are found to be equally efficient. This would appear to us somewhat of the nature of gradual withdrawal of which he says he does not approve. Chiefly, however, the patient's suffering is subdued by the discrete administration of scopolamine

(hyoscine) in such doses as are necessary to overcome all painful symptoms and to keep the patient comfortable, the dose being $\frac{1}{300}$ to $\frac{1}{50}$ grain as required by the individual case.

"Alcohol in all forms should be interdicted during the convalescence and forever afterward," but institutional treatment, strychnine in large doses to excite the motor function of the bowel, liberal diet and narcotics other than scopolamine are used as adjuvants. Among the narcotic adjuvants employed are atropin, daturin, gelseminin, pilocarpin, and aspirin. Elimination, judicious withdrawal of the drug, control of withdrawal symptoms by scopalomin and other narcotics, support by liberal diet and strychnin are the agents for the details of whose use the reader is referred to the book.

Other subjects treated are the cocaine habit, chronic alcoholism, delirium tremens as well as the acute ailments occurring in persons addicted to the habitual use of narcotic drugs.

Much interesting and valuable information in the shape of quotations from the literature on "opium addiction" and on collateral matters is contained in the book which makes it interesting reading. Not the least of these are extracts from De Quincy's "Confessions of an Opium Eater, his "Pleasures and Pains of Opium" and other essays. Most of the generation which read these interesting papers when published in the "fifties" and earlier, during the height of De Quincy's popularity have passed away and there are perhaps few living who are familiar with them. Notwithstanding the mischief they may have done at the date of their publication in suggesting the use of opium for the sake of the pleasure pictures which De Quincy drew, they should be read as representing the classics of a brilliant period in the history of English literature, covering that part of the Victorian age from 1837 to 1859, in which De Quincy's "faultless refinement of style" and "marvellous mastery of phrase" played a conspicuous role. J. T.

ORGANIC AND FUNCTIONAL NERVOUS DISEASES. A TEXT-BOOK OF NEUROLOGY. By M. ALLEN STARR, M.D., PH.D., LL.D., Sc.D., Professor of Neurology, College of Physicians and Surgeons, New York. Fourth edition. Pp. 970; 323 engravings and 30 plates. Philadelphia and New York: Lea & Febiger, 1913.

WHEN Dr. Starr's work first appeared, it was as a treatise on organic nervous diseases, but all subsequent issues have included functional disorders and it is in the latter section that most of the new matter has been inserted. In the preface of this edition it is stated that chapters are added on symmetrical gangrene and

"morphinism" and prefers that of "narcotic addiction," which should meet with general approval. Further, he considers it a disease and not a habit, a toxemia of drug, auto, and intestinal origin belonging to the field of medicine and not neurology. The use or rather the misuse of the hypodermic syringe is held responsible for the alarming increase of cases of morphine addiction in the last forty years. At this point may be mentioned a valuable practical fact evolved from the experience of the author that "in the average Caucasian, thirty days daily use of morphine is enough to establish the 'addiction' to such a degree that very few persons would be able to extricate themselves from it by their own efforts."

Consistently with his belief that the disease is purely and solely a toxemia, he claims that if every cell and structure of the patient's body can be freed from toxic matter there will be no nervous manifestation or suffering incident to the withdrawal of the narcotic. The successive doses of the drug imperfectly eliminated, tend each time to promote its accumulation in the tissues. To the drug, however, are added other waste products whose elimination is suppressed by its presence and to these more than to the narcotic itself the author assigns the symptoms and complications met on its withdrawal, these symptoms being held in abeyance during its administration. Elimination is therefore the keynote of treatment. To this end the bowels and kidneys are availed of, the former with a view more especially to promoting biliary secretion and relieving portal congestion. The administration of purgatives is, moreover, preceded by full doses of strychnin to stimulate the unstriated muscular fibers of the intestine before the centres governing voluntary motion are materially affected. Calomel, cascara, rhubarb, and castor oil as determined by circumstances are purgatives mentioned as meeting the indication, but calomel especially.

The author does not approve of the gradual withdrawal of the drug, saying that "it is as unreasonable and unscientific as unsuccessful." On the other hand he says also the abrupt withdrawal of an opiate from a person addicted to its use without preparing his system for it is not only dangerous to life but it is barbarous. This statement seems somewhat contradictory, but he says also that such danger is, however, obviated if a proper course of preparatory treatment is carried out, namely the eliminative and the "cleansing" treatment above referred to. The purgative treatment is started about 4 P. M. and the last dose given at about 10 P.M. At first the opiate is kept up in the usual doses but none given after 8 or 10 P.M., until after the bowels are moved the following morning. It is again briefly returned to under certain conditions, in much smaller doses which are found to be equally efficient. This would appear to us somewhat of the nature of gradual withdrawal of which he says he does not approve. Chiefly, however, the patient's suffering is subdued by the discrete administration of scopolamine

(hyoscine) in such doses as are necessary to overcome all painful symptoms and to keep the patient comfortable, the dose being $\frac{1}{200}$ to $\frac{1}{75}$ grain as required by the individual case.

"Alcohol in all forms should be interdicted during the convalescence and forever afterward," but institutional treatment, strychnine in large doses to excite the motor function of the bowel, liberal diet and narcotics other than scopolamine are used as adjuvants. Among the narcotic adjuvants employed are atropin, daturin, gelseminin, pilocarpin, and aspirin. Elimination, judicious withdrawal of the drug; control of withdrawal symptoms by scopalomin and other narcotics, support by liberal diet and strychnin are the agents for the details of whose use the reader is referred to the book.

Other subjects treated are the cocaine habit, chronic alcoholism, delirium tremens as well as the acute ailments occurring in persons addicted to the habitual use of narcotic drugs.

Much interesting and valuable information in the shape of quotations from the literature on "opium addiction" and on collateral matters is contained in the book which makes it interesting reading. Not the least of these are extracts from De Quincy's "Confessions of an Opium Eater, his "Pleasures and Pains of Opium" and other essays. Most of the generation which read these interesting papers when published in the "fifties" and earlier, during the height of De Quincy's popularity have passed away and there are perhaps few living who are familiar with them. Notwithstanding the mischief they may have done at the date of their publication in suggesting the use of opium for the sake of the pleasure pictures which De Quincy drew, they should be read as representing the classics of a brilliant period in the history of English literature, covering that part of the Victorian age from 1837 to 1859, in which De Quincy's "faultless refinement of style" and "marvellous mastery of phrase" played a conspicuous role. J. T.

ORGANIC AND FUNCTIONAL NERVOUS DISEASES. A TEXT-BOOK OF NEUROLOGY. By M. ALLEN STARR, M.D., PH.D., LL.D., Sc.D., Professor of Neurology, College of Physicians and Surgeons, New York. Fourth edition. Pp. 970; 323 engravings and 30 plates. Philadelphia and New York: Lea & Febiger, 1913.

WHEN Dr. Starr's work first appeared, it was as a treatise on organic nervous diseases, but all subsequent issues have included functional disorders and it is in the latter section that most of the new matter has been inserted. In the preface of this edition it is stated that chapters are added on symmetrical gangrene and

angioneurotic edema. There are still some diseases which we feel might with advantage be included and among these are exophthalmic goitre and acromegaly; such diseases appear as worthy of consideration here as does paresis.

The chapter on brain tumors has been rewritten and considerable new matter is presented. Chloroma is discussed and a patient with such a tumor in whom both optic nerves, one sixth nerve, both glossopharyngeal nerves and one hypoglossal nerve were paralyzed was seen by the author. Tumors of the cerebellopontine angle are given much more consideration than formerly and the symptoms are divided into three classes: (1) Those referable to the cranial nerves; (2) those referable to the involvement of the cerebellar peduncles; (3) those referable to compression of the tracts passing through the pons.

Pellagra has been included and headache and the disorders of sleep have been given separate consideration.

The chapter on epilepsy remains unchanged. We do not agree with the author in the prominence given alcohol as a cause of epilepsy. Even in parents, the nervous instability which drives them to drink may in part be responsible for the development of epilepsy in the child. The report of the Craig Colony for 1912 gives alcoholism as the probable cause in less than one per cent. of the admissions for that year. We know that drinking is very common and epilepsy is relatively rare; alcoholism is much more common among males while epilepsy is at least as common among females; many cases of epilepsy have developed before the age when drink could be obtained; and even those drinkers who have convulsions (so-called acute alcoholic epilepsy) seldom have fits independent of their drinking.

The most notable addition to the book is in the chapter on hysteria. Of the theories of this disease, those of Babinsky, Janet and Freud are briefly set forth. As to Freud's hypothesis, elements of truth are admitted, but its many errors call forth sharp criticism from the writer, which in the main is, that the method is most limited in its scope and has many objectionable features not shared by the direct persuasion of Babinsky or the hypnosis of Janet.

This volume is by no means a compilation. It is announced in the foreword that the author has drawn many definite conclusions from the mass of pathological and clinical material that has accumulated in the thirty years' practice of his specialty, and this statement is well borne out in the text. The book bears more of the imprint of the personal observation of its author than any neurology that has yet appeared by an American writer, and this feature accords it a most welcome place in the library of the neurologist. It is, furthermore, a most excellent work for the student and practitioner. N. S. Y.

THE SURGICAL CLINICS OF JOHN B. MURPHY, M.D., AT MERCY HOSPITAL, CHICAGO. Volume II: February, pp. 179, 32 illustrations; April, pp. 174, 35 illustrations. Philadelphia and London: W. B. Saunders Company, 1913.

THE first number of the second volume of Murphy's Clinics opens with an interesting address by Mr. W. Arbuthnot Lane, of London, on the open treatment of fractures. This is a written address, carefully prepared, and read at Dr. Murphy's clinic, November 23, 1912. In it Mr. Lane reviews his work in the operative treatment of fractures from its inception over twenty years ago to the present time. He says "till surgeons generally have improved their technique sufficiently, and have acquired a greater familiarity with the operative treatment of fractures, a varying degree of risk must necessarily accompany any open operation, and this danger has to be taken into consideration." After urging the importance of skiagraphs in determing for or against immediate operation, he recommends that, whatever course of treatment is decided on, it is advisable "to obtain a written and witnessed acquiescence, so as to secure the medical attendant from subsequent loss, annoyance, and anxiety." He proceeds: "to trust entirely to the now practically obsolete symptom called crepitus, and to an imaginary familiarity with the other clinical symptoms of fracture, is absurd in the present day, when every detail of any importance can be learnt by means of radiography, which is perfectly reliable in competent hands." Evidently he must think a great deal of time is wasted in most medical schools in teaching students how to reach a diagnosis in cases of suspected fracture. How much simpler to let the Professor of Röntgenology conduct all the instruction in fractures, and for the country doctor to send every patient who sustains any injury whatever to any of his limbs, to the nearest city, perhaps fifty or a hundred miles distant, for radiographic examination, in order to ascertain whether or not a fracture is present. Not only this, but, according to Mr. Lane's standard, it is perfectly unjustifiable at the present day for any one but a competent and *experienced* "bone surgeon" to undertake the treatment of any fracture.

Another interesting address in this same number is that by Dr. W. C. Woodward, Health Officer of the District of Columbia, on the "Medico-legal Relations of Physician and Patient."

In addition to these more or less formal addresses there is the usual abundant supply of clinical material discussed entertainingly and instructively by Dr. Murphy himself: this includes osteitis of the femur; floating cartilages in the knee; fecal fistula following appendectomy; tuberculosis of the knee; amputation of the breast for Paget's disease; pyosalpinx; cerebral decompression; laminectomy for paraplegia; congenital pyloric stenosis and hour-glass stomach. The value of these clinics is materially

enhanced by the diagnostic acumen of Dr. C. L. Mix, who is almost constantly present to comment on aspects of the cases which are not purely surgical.

The second number, that for April, is largely devoted to abdominal lesions. Noteworthy is the address by Mr. Robert Milne, of the London Hospital, on certain aspects of gastric ulcer. He says: "In the mucous membrane of the stomach, and even partially in the submucous coat, there are small collections of lymphoid tissue. These are in greatest number along the lesser curvature and in the prepyloric region of the stomach; rare in the cardiac portion. Although small in a healthy stomach, when inflamed they swell up, push the mucous glands apart to each side, and reach the surface." From this point on the pathogenesis of gastric ulcer is largely conjectural; he conjectures that if suppuration occurs in these lymph follicles and that if they burst into the gastric cavity, then the gastric juice is allowed to enter, digests the coat of the stomach, and thus may lead either to the acute perforating ulcer or to the chronic ulcer and so to carcinoma. On the other hand, ulceration into a bloodvessel may occur, and in this way he conjectures hemorrhagic erosions arise. He further discusses in an interesting manner the modern theories as to the pathogenesis of gallstones and renal calculus.

Dr. Murphy's reported operations and clinical lectures include: hysterectomy for "essential hemorrhage" of the uterus; a number of upper abdominal cases; cases of intestinal surgery (adhesions, short-circuiting, etc.); spina bifida; laminectomy for fracture of the spine, with discussion of the neurological aspects of the case by Dr. Peter Bassoe; a case of ureteral calculus; one of cerebellar tumor with subtentorial decompression; transplantation of bone for necrosis of the tibia; plating a fracture of the leg (operation by Dr. Philip H. Kreuscher); amputation for periosteal sarcoma of the thigh; as well as other topics too numerous to mention.

This volume gives evidence so far of more careful preparation than the earlier numbers of Volume I; and from the editor's note at page 242 it appears that the editor is Dr. Murphy himself. Some pages of the April number have a faint smell of the lamp about them; but for educational purposes this steadier light is perhaps preferable to the sparks and flashes which were so abundant at first.

A. P. C. A.

STUDIES IN SMALLPOX AND VACCINATION. By WILLIAM HANNA, M.A., M.D., D.P.H., Assistant Medical Officer of Health of the Port of Liverpool and Visiting Physician to the Port Isolation Hospital. New York: William Wood & Company, 1913.

THE author presents a monograph of 52 pages containing 24 full-page halftone illustrations devoted to the influence of vacci-

nation as based on an analysis of 1163 smallpox cases observed by him in the city and port of Liverpool.

Among 943 cases of smallpox vaccinated in infancy, there were 28 deaths, or 2.9 per cent., while among 220 unvaccinated, there were 60 deaths, or 27.2 per cent.; the ratio of deaths to attacks was ten times as great in the unvaccinated as in the vaccinated. These figures are, in a general way, confirmatory of the common experience of smallpox hospitals as to the life saving influence of vaccination.

The opponents of vaccination, in order to discredit the statistics of smallpox hospitals, are forced to charge, as they virtually do, a world wide and century long conspiracy among the officers of these institutions to falsify the classification of the vaccinated and unvaccinated groups. The charge is that being in favor of vaccination, the physicians are so biased that their observations are worthless. If the observations of men of vast experience in smallpox are worthless, what can be said of the observations of the paper statisticians opposed to vaccination.

Dr. Hanna makes an interesting contribution to the study of the mutual influence of concurrent vaccinia and smallpox in cases in which vaccination was performed during the period of variolous incubation. In consonance with the views of others, he finds that a vaccination performed subsequent to infection with smallpox, will "take" and pass through its typical course, up to the date of onset of symptoms of smallpox.

The chances of suppression or favorable modification of the oncoming smallpox, are in inverse ratio to the period elapsing between smallpox infection and vaccination; the later the smallpox appears after vaccination, the greater is the opportunity for the vaccination to be successful and develop its counteracting immunity. The author states that "vaccination requires nine days to develop an immunity which will absolutely prevent or minimize an attack of smallpox."

The author makes some interesting observations on the question of vaccination after the onset of smallpox. "The operations performed subsequent to the onset of symptoms were unsuccessful." He believes, however, that in some cases the vaccine organisms introduced into the system may have had some modifying effect, although the reaction was not typical.

In cases vaccinated late in the course of the disease, no reaction appeared at the site, except of course the usual scarification crust. An erroneous judgment may be reached through confusing the increased variolous eruption about the vaccination site as the effect of vaccination.

The little volume contains an illuminating series of well-executed photographs showing concurrent vaccination and variola. The monograph will prove of particular value to vaccine physicians, health officers, and others specially interested in the subject.

J. F. S.

FURTHER RESEARCHES INTO INDUCED CELL REPRODUCTION AND CANCER. Consisting of papers by H. C. ROSS, J. W. CROPPER, and E. H. ROSS. Vol. II. Pp. 120; 9 illustrations. London and Philadelphia: John Murray and P. Blakiston's Son & Co., 1912.

THE work described in this book is a continuation of earlier work on the same general subject. Among other things, the workers claim to have produced swellings resembling tumors in experiment animals. They have used the same general methods as Leo Loeb and as Stoeber and Wacker, and have reached the same results, but the descriptions of experiments and results leave much to be desired in conciseness and accuracy of statement, so that the reader has difficulty in reaching a definite conclusion.

The writers claim to have induced division of trypanosomes, but although the studies are of some interest, they are by no means conclusive. E. H. Ross has worked out the development of the leukocytozoön of the guinea-pig (Kurloff), but no very definite conclusions are drawn. J. G. Thomson has prepared an extremely concise and clear description of a spirochete found in the feces of the guinea-pig.

It is difficult to comment on the book as a whole because for the most part it is no more than an amplification of statements made in the preceding volumes. It may be said, however, that the reviewer finds no more conviction in this book than in the others and sees little reason for its publication. H. T. K.

PHYSICAL DIAGNOSIS. By RICHARD C. CABOT, M.D., Assistant Professor of Medicine in the Harvard Medical School, Boston. Fifth edition. Pp. 519; 5 plates and 268 figures in the text. New York: William Wood & Co., 1912.

A BOOK which has reached its fifth edition in seven years (the fourth in 1909) like good wine "needs no bush." It is for the most part sufficient, therefore, to note the chief changes which have been made to bring it up-to-date. They include sections on the phlebogram, the arteriogram, the recasting of the section on blood pressure and the arrhythmias, on subphrenic abcess and peptic ulcer. The section on bismuth *x*-ray examination of the stomach is also enlarged. Dr. Cabot's characteristic incisive style marks the book throughout and increases its attractiveness. It is at once a book of reference and a reliable source of information helpful to a correct diagnosis, the essential basis of a correct treatment. We know of no book on the subject which is more

accurate in its descriptions and more reliable in its statements. Its size, midway between the brief compend and the unwieldly heavy volumes so often met, is a quality which contributes to the convenience and facility in handling so necessary to the greatest availability of a book. J. T.

PRINCIPLES OF HYGIENE, AND PRACTICAL MANUAL FOR STUDENTS, PHYSICIANS, AND HEALTH OFFICERS. By D. H. BERGEY, A.M., M.D., First Assistant, Laboratory of Hygiene, and Assistant Professor of Bacteriology, University of Pennsylvania. Fourth edition. Philadelphia and London: W. B. Saunders Company, 1912.

THE previous editions of Dr. Bergey's *Principles of Hygiene* have had a very wide distribution, and have been well received by workers in this field. The present edition promises to keep up this reputation. The great advancement in our knowledge concerning the methods of causation and prevention of disease has made necessary rather rapid revision of works on hygiene. The book under discussion has been brought up to the latest ideas in the subjects treated. This is especially noticed in the section on water and sewage purification, and prevention of disease especially in typhoid fever and dysentery, as well as the chapter on immunity. The work is well written, without padding, and discusses hygiene in every possible phase. It contains the best thought of the day in systematic, interesting, and instructive groupings. One criticism might be lodged against the statistics quoted in dealing with medical inspection of schools, when better and more recent ones have appeared in a publication well commented on in these same columns. With this slight criticism, the book may be well recommended to anyone interested in any of the subjects in this great field, which is now occupying so much attention in the line of preventive medicine. F. H. K.

CEREBELLAR FUNCTIONS. By Dr. ANDRE-THOMAS, of Paris. Translated by W. CONYERS HERRING, M.D. Pp. 223; 89 illustrations. New York: Journal of Nervous and Mental Disease Publishing Co., 1912.

THIS is the twelfth volume of the monograph series issued by the editor of the *Journal of Nervous and Mental Diseases*. As heretofore stated in previous reviews, Dr. Jelliffe is to be congratulated upon his invariably good selection for his series. The present brings to the English-speaking physicians a translation

of a small book upon cerebellar functions originally in French. This work aims to bring up to date the functions of the cerebellum. Not much space is given to anatomy, but the results of experimental work are fully detailed, and then a discussion is taken up of the relation of such experimental work with actual clinical phenomena. In other words, it is an up-to-date presentation of what is known of the cerebellum, and should be in the hands of every neurologist.

T. H. W.

MINOR MALADIES. By LEONARD WILLIAMS, M.D., M.R.C.P., Physician to the French Hospital; Physician to the Metropolitan Hospital. Third edition. Pp. 396. New York: William Wood & Company, 1913.

THE author has compiled a series of lectures into a small volume, dealing with minor ailments or symptoms which are necessarily, as he says, dealt with in a cursory manner in the ordinary text-book. The minor maladies include such disorders as coughs, colds, sore throats, indigestion, constipation, giddiness, rheumatism, and similar disorders. He discusses briefly the etiology of these minor conditions and then enlarges upon their treatment. The author takes the correct view of the etiology of these ailments, laying particular stress upon the fact that while the discussed condition may be only a manifestation of a slight disorder they are frequently the expression of a serious disease which must be sought for and eliminated or alleviated before hoping to cure the minor complaint. Thus, the pretuberculous stage of phthisis, that is, the condition in which there is nothing which points to a positive diagnosis but in which there are indications sufficiently important to be greatly suspicious, is extensively considered and many persistent minor complaints or signs are shown to be directly the result of pulmonary tuberculosis. The more elaborate discussion of treatment of minor maladies is extremely valuable and thoroughly practical. Several criticisms of the subject matter may be made, however. In the first place proprietary preparations play a prominent part in much of the therapeutic advice the author gives and in the second place, medicinal treatment completely overshadows physical, dietetic, and others lines of treatment which may be employed in curing not only minor but major disorders.

In addition to the above, there are several other chapters dealing with such subjects as changes of air, general health, insanity, and a short exposition on the use of a few of the more important drugs. This last chapter is particularly timely and valuable, showing, as it does, the effects and results that can be achieved by the proper management of the old standard preparations, without the employment of the proprietaries the author recommends in the forepart of the book.

J. H. M., JR.

PROGRESS

OF

MEDICAL SCIENCE

MEDICINE

UNDER THE CHARGE OF

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Oleum Chenopodii in the Treatment of Hookworm Disease.—W. SCHÜFFNER and H. VERVOORT (*Münch. med. Woch.*, 1913, lx, 129) have worked out an ingenious method for testing the efficacy of vermifuges. Their studies have been made on a very large series of cases—1457 persons infected with the hookworm and with Ascaris lumbricoides. The method consists in giving two treatments to a patient within a few days, the first with one drug, the second with another. This is carried out on a large number of patients. The worms recovered from the feces are counted, and the sum of the worms obtained at both treatments is determined. In this way they determine the percentage of the total number of worms originally present which were unaffected by the first drug, but which succumbed to the second. In another series of equal size, the order of the drugs is reversed. Using this method, Schüffner and Vervoort have tested the efficacy of thymol, oil of eucalyptus, beta-naphthol, and oil of chenopodium. They find the relative efficiency of the four drugs to be, for the hookworm, oil of eucalyptus, 38; naphthol, 68; thymol, 83; and oil of chenopodium, 91. For the round-worm, the same order is maintained, though the figures differ somewhat; oil of eucalyptus, 12; naphthol, 18; thymol, 78; oil of chenopodium, 87. Schüffner and Vervoort consider oleum chenopodii, which is official in the United States *Pharmacopœia*, to be a safe vermifuge, and in view of the excellent results they obtained with it, their method of administration becomes of interest. At two-hour intervals three doses of oleum chenopodii, each dose 16 drops with sugar, are given. Two hours after the last dose they give castor oil 17 grams and chloroform 3 grams.

The Examination of the Feces for Parasitic Ova.—F. WOLFF (*Berl. klin. Woch.*, 1913, l, 301) confirms the value of Yaoita's method of examining the feces for parasitic ova. As described by Wolff, the method is as follows: From five different parts of the stool one takes a piece of fecal matter about the size of a pea; these are then placed in a test-tube with a mixture of 25 per cent. antiformin and ether in equal parts and vigorously shaken. The feces dissolve largely in this reagent with the evolution of gas. The solution is now filtered through a hair filter to remove the large food particles, the filtrate is centrifugalized one minute, and the sediment contains the ova in addition to the insoluble parts of the feces. Wolff recommends the use of the usual direct microscopic method of examination in addition to the foregoing, as it occasionally yields positive results where Yaoita's method is negative.

Study of Cultures in the Blood and Sputum in Lobar Pneumonia.—HASTINGS and BOEHM (*Jour. Exper. Med.*, 1913, xvii, 239) have studied 32 selected cases of lobar pneumonia by cultures from the sputum and blood. Positive blood cultures were obtained in 11 of these (30.3 per cent.), the pneumococcus being isolated from 9 and streptococcus hemolysans from 2. In every instance the same organism was isolated from the sputum. In 21 cases the blood cultures were negative. In 9 of these the pneumococcus was obtained from the sputum. Of the other 12, Bacillus coli was isolated in 2, Micrococcus catarrhalis in 1, Staphylococcus in 1, streptococcus in 2, Bacillus influenzæ in 1. Hastings and Boehm conclude that typical cases of lobar pneumonia, in which no pneumococci are to be found either in the blood or sputum, probably exist more frequently than is generally supposed. These cases are not to be distinguished from the pneumococcus group except by blood and sputum cultures.

Pneumonic Lesions Made by Intratracheal Insufflation of Non-virulent Pneumococci.—In previously reported investigations WOLLSTEIN and MELTZER produced pneumonia in animals by the intertracheal insufflation of virulent organisms. The pneumonias produced by streptococcus and influenza bacillus were of the lobular type distinct from the lobar pneumonia produced by the virulent pneumococcus. A point recently added is the fact that in every case twenty-four hours after insufflation of a virulent pneumococcus, this organism could be cultivated from the heart's blood, whereas three or four days later, in the non-fatal cases, the lungs, as well as blood were free from the pneumococcus. This probably has its analogy in clinical findings. The conclusion was presented that different types of pneumonia are produced by specifically different bacteria. Wollstein and Meltzer (*Jour. Exper. Med.*, 1913, xvii, 353) continued the work, with the intrabronchial insufflation of a non-virulent strain of pneumococcus, to determine the influence of virulence of organisms. None of the dogs died, and few seemed ill with fever. All were killed at periods of one to seven days. The anatomical diagnosis was that of an early, not severe, lobar pneumonia in the stage of red hepatization, the condition of engorgement being still present in portions of the lobe, in the twenty-four specimens. Then followed specimens

of more advanced consolidation and, finally, in the five-day cases, resolution. The exudate left the lung framework unaffected. The lesion presented the gross appearances of a lobar pneumonia, and differed from that produced by virulent pneumococci in that the consolidation resolved more rapidly, the disease was non-fatal, the blood was not invaded, and the exudate poor in fibrin. They conclude the pneumonia caused by the streptococcus is not merely a form caused by a less virulent organism, but rather a type distinct and separate, characterized especially by the invariable leukocytic infiltration of the framework of the lungs. They later (*Jour. Exper. Med.*, 1913, xvii, 242) determined that intrabronchial insufflation of a culture of virulent pneumococcus killed by heat and still containing stainable organisms produced an inextensive, mild, patchy, superficial inflammation of the lung tissue, bearing no similarity to the lesions produced by the living pneumococcus. The insufflation of sterile bouillon caused a pronounced congestion of the lung tissue, lasting forty-eight hours.

On a Papillomatous and Carcinomatous Tumor in the Stomach of Rats Caused by a Nematode.—J. FIBIGER (*Berl. klin. Woch.*, 1913, I, 289) has made important observations on the genesis of tumors in rats, which he summarizes as follows: (1) A hitherto unknown disease of the stomach and esophagus of the rat (Mus decumanus) is caused by an undescribed nematode belonging to the genus Spiroptera. The parasite in its adult form lives in the squamous epithelium of the above mentioned organs. The intermediate host in the development of the parasite is an insect (die Schabe)—Periplaneta americana, Periplaneta orientalis. (2) The disease has been observed partly as an endemic affection in a restricted locality, partly as an experimental disease of laboratory rats induced by feeding them the infected intermediate host. (3) The initial stage of the disease consists of hyperplasia of the epithelium and inflammation. In marked cases papillomas develop; they may become enormous, filling almost the entire stomach. The papilloma may become the site of malignant degeneration of the epithelium with infiltrative growth, as happened in four of the experimentally infected animals. The malignant change occurs relatively late. (4) In two, and possibly three, of the experimentally infected rats which developed carcinoma, metastases were observed in other organs. Thus, for the first time, Figiber says, metastasizing carcinomas have been experimentally induced. (5) In the metastases no parasites or ova were found. The development of the metastases is, therefore, to be attributed to the ability of the epithelial cells of the stomach to grow in other organs of the body without the help of a parasite. (6) So far as Fibiger's studies go, he believes it may be said that the anatomical changes found were probably due to poisonous products of the nematode. Such genesis of malignant tumors cannot be further developed with the facts thus far observed. (7) The hypothesis of Borrel and Haaland that nematodes may be a cause for the development of malignant tumors in mice and rats is confirmed by these observations. (8) Borrel's belief in the importance of nematodes for the endemic occurrence of tumors in mice is apparently correct.

Heart Size and Function in Cases of Orthostatic Albuminuria.—The diversity of opinions and findings as to the close relationship of orthostatic albuminuria to the cardiovascular system led Bass and Wessler (*Arch. Int. Med.*, 1913, xi, 403) to study the hearts and blood pressure in 36 cases in children. The functional heart examination in each case included physical examination, orthodiography, and pulse before exercise and immediately after. In only 1 case was the heart larger than normal. Twenty-two cases show values lower than normal. Fifteen children complained of subjective cardiac symptoms or presented signs of cardiac abnormality on physical examination. All except 4 showed no enlargement by either percussion or fluoroscopy. In no case did the heart become larger after exercise. However, complaints of dyspnea on exertion, palpitation, or precordial pain were common. Twelve had distinct signs of relative heart insufficiency, as accentuated pulmonary second sound, apical systolic murmurs, booming first sounds, and increased dulness to left. These indicate dilatative weakness. The results prove that the cardiac symptoms in this distinct clinical group must find explanation elsewhere than in the altered heart size, possibly in some disturbance in the vasomotor system. The failure of the hearts to become smaller after exercise is looked upon as a restriction of the field of cardiac response. In 30 per cent. of the cases Bass and Wessler found hearts of the drop type, especially associated with other stigmas of constitutional maldevelopment.

The Treatment of Infection with Oxyuris Vermicularis.—B. Hildebrand (*Münch. med. Woch.*, 1913, lx, 131) has found it difficult to rid patients of infection with Oxyuris vermicularis. Remedies given by mouth or irrigations often fail of their purpose. He has taken advantage of the habits of the worm in attempting a cure. It is a well-known fact that the gravid female either deposits her ova in the rectum, in which case the ova pass out in the feces, or that she crawls out the anus and oviposits on the neighboring skin, usually that of the perineum. Through the itching which the crawling of the worm causes, the patient scratches the part, and thus the eggs, picked up on the fingers, may be transferred to the mouth, pass through the stomach, and develope into adult parasites in the intestine. In this manner, a constant reinfection occurs. Hildebrand finds that a salve, capable of killing the ova, ends the infection, when applied to the skin of the perineum. Morning and evening, or after defecation, the skin about the anus is thoroughly cleansed with soap and water. Then the skin is covered with a salve containing camphor, quinine, and thymol (the formula is not given). The ova which are deposited on this ointment are destroyed by it. The treatment is continued for two or three weeks. The hands and fingernails should be thoroughly cleaned after each application of the salve. The source of reinfection is thus destroyed, and in a short time the females die. Hildebrand has cured a number of cases of long duration with this method of treatment.

SURGERY

UNDER THE CHARGE OF

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Experimental Study Concerning the Influence of an Affected Kidney upon the Kidney of the Other Side.—ISOBE (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1913, xxii, 1) says that it has long been known that a pathological condition of one kidney can exert a disturbing influence on the other kidney. This has been established in connection with wounds, tuberculosis, calculi, hydronephrosis, and tumors. They may lead to a marked diminution of the urine, even to anuria. A nephrectomy or nephrotomy of the affected kidney may cause an increase of the urine. From his experimental studies, Isobe believes that when the lesion of one kidney is severe the products of decomposition are absorbed into the blood and produce a toxic effect upon the epithelium of the other kidney and more or less severe parenchymatous changes in it. When wounds of one kidney are of very mild grade, so that only little toxic substance is produced, there develops only a more or less distinct hypertrophy of the other kidney. The decomposed kidney substance is, according to Isobe's view, specifically toxic and acts upon the kidney alone. From a practical standpoint, a diseased kidney on one side calls for operation as early as possible, before the degenerative changes in the other kidney can occur.

Fat Embolism of the Systemic Circulation and its Cause.—FROMBERG (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1913, xxii, 23), from a clinical, autopsy, and histological study of one case and a study of the literature, says that fat emboli in the systemic circulation are rare. Multiple miliary hemorrhages, seen at autopsy after an accident, should always arouse suspicion of fat emboli. The number of small hemorrhages in the brain is probably an indication of the severity of the condition of fat embolism. Emphasis is to be laid on the fact that hemorrhages in the cortex are rare. Fat embolism in the systemic circulation favors the deposit of masses of fat in the lung, which filters the fat out of the blood, favors increase of the lumen of the lung capillaries, and increased pressure in the lung vessels. Fromberg believes that he has shown that the persistence of the foramen ovale is an important factor in the production of fat embolism in the systemic circulation. In future cases attention should be directed to

the foramen ovalé to determine whether and how often fat embolism can develop in the systemic circulation in the presence of a closed foramen ovale.

A Contribution to the Question of the Origin of the So-called White Bile with a Complete and Permanent Closure of the Common Bile Duct.—Bertog (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1913, xxii, 49) says that hydrops of the whole biliary system is not a rare occurrence. He believes that the closure of the common duct must be absolute and permanent to produce this result. This will be due in most cases to a tumor, but it may be due to closure by a calculus, if the complete closure lasts long enough. The time from the occurrence of the closure to the appearance of the so-called white bile, is variable. It must be long enough, however, for the absorption of all the bile in the biliary passages. The pressure in the ducts must be high enough to overcome the pressure of the secretion in the liver. There need not be present a hypersecretion of mucus in the bile ducts, but the dilated ducts will be filled with mucus to such an extent that the bile produced in the liver cannot get into the ducts. The secretion of the bile by the liver cells gradually decreases in consequence of the stasis in the biliary passages.

The End-results of Radical Operation for Knee-joint Tuberculosis in Adults.—May (*Deutsch. Zeitschr. f. Chir.*, 1913, cxxii, 171) says that his work is a continuation of the investigations of Brandes concerning the end-results of radical operation for knee-joint tuberculosis in children, and was done to determine whether the curved resection method of Helferich gives better results than other methods. Helferich's method as applied to adults is briefly outlined as follows: Under narcosis and with a bloodless limb, two lateral skin incisions are made and united by an anterior transverse incision. After turning up the skin flaps, the capsule and patella are extirpated. Then with a Helferich saw, an arched, thin layer of cartilage and bone are removed from each joint end. The wound surfaces are then covered with an iodoform mixture, and the bone ends adapted to each other. Usually the only fixation of the bone ends consisted of cat-gut sutures passed through the edges of the bones and the ends of the sutures brought out of the two lower ends of the longitudinal skin incision to act as drains. An exact extension position is maintained between the resected surfaces, as a rule, by a splint and bandage, which is removed for the first time in about three weeks. The sutures are then removed and, if the extension position is not complete, it is corrected under narcosis and a plaster cast is applied. The patient is then discharged from the hospital, but wears the cast eight months longer, and after that a leather support. Within the nine years from 1898 to 1907, 76 radical operations were performed on adults in Anscutz's clinic in Kiel, for tuberculosis of the knee-joint. The operations performed were as follows: 3 arthrectomies, 8 primary amputations, 57 resections, and 8 secondary amputations. Almost all those still living have been personally examined. None shows any noteworthy flexion. In only one was there marked shortening which, however, existed before the resection. The Helferich excision produces an average shortening

of 3.7 cm. 76.4 per cent. of the adult cases have, from resection, the prospect of a useful limb. Three-fourths, or 77.8 per cent. of the fatal cases were due to the tuberculosis. All of the 32 living patients possess, today, a firm ankylosis and are capable of earning their living with the exception of 2. The cause in these is tuberculosis elsewhere. Of those aged over forty-five years, success was obtained in 50 per cent. Resection may be advised at this age in suitable cases.

Radical Operation for Intestinal Herniæ with Incomplete Hernial Sac (Gliding Herniæ).—SCHMIDT (*Deutsch. Zeitschr. f. Chir.*, 1913, cxxii, 266) says that in gliding herniæ on the right side, the involved portion of the intestine has a single limb, on the left side it is in a loop with two limbs, an afferent and efferent. To find the empty portion of the hernial sac, an effort should be made to pick up a fold of it between the fingers and prove the mobility of the layers on each other. The reposition of a portion of the sac, whether it has been opened or closed by sutures after being opened, is produced by inversion. The excess of sac should be excised before reposition, but that portion containing the vessels nourishing the intestine, must be spared. To recognize this portion, the sac should be so held as to transmit light through it. Generally, there is no danger in cutting away the anterior layer of the sac from the internal angle of the hernial orifice around the orifice to the junction of the serosa of the sac and intestine, and then along this junction throughout. A flap of hernial sac may be preserved from this portion. In isolated gliding hernia of the appendix, the latter and the sac should be removed. If the ileum is involved in the hernia, the sac below the hernia should be removed. On the left side the loop formation calls for later flaps from the convex margin of the intestine. Not rarely the separation of the hernial sac from the spermatic cord proves very difficult, and castration is repeatedly necessary. In such cases it will be better to implant the testicle and cord in the abdominal cavity.

The Reduction of Fractures by Local Anesthesia.—DOLLINGER (*Zentralbl. f. Chir.*, 1913, xl, 763) reduces simple fractures of the extremities under the control of the fluoroscope or skiagraph and fixes them immediately by a plaster cast. Recently he has added the use of local anesthesia. The anesthetic employed was novokain-suprarenalin solution, and was injected either between the fragments or around the limb above the fracture. In using the first method he established the site of fracture by the *x*-rays, and then injected 10 to 20 c.c. of a 1 per cent. novocain-suprarenalin solution exactly between the fragments. Unless this is accomplished, complete success will not be attained. Anesthesia is obtained within five to ten minutes, after which the fragments can be manipulated without pain. This method has the following disadvantages: (1) The usual acute tenderness at the seat of fracture makes the introduction of the needle very unpleasant. (2) The blood clot between and around the fragments may prevent the anesthetic fluid from coming into direct contact with the nerves, while it may find its way into the open vessels and cause toxic symptoms. (3) The exact location of the fracture may be

very difficult in fat people or in the presence of hematoma formation, so that the placing of the fluid between the fragments, may be difficult. These disadvantages probably explain why this method has not received general support. The circular injection method gives much better results. After disinfection of the skin with tincture of iodine, the whole circumference of the limb is injected about four fingers' breadth above the fracture. If there is a large hematoma, the injection may be made higher, even 10 to 20 cm. above the fracture and above the hematoma. First the skin and subcutaneous tissue are infiltrated, and then the deeper layers until the whole thickness of the limb is infiltrated. As few punctures as possible should be made. For the leg three or four are sufficient, for the thigh four or five, and for the forearm two. In about ten minutes after the infiltration there will be complete anesthesia peripheralward, and the reflex muscle spasm will be overcome. The fracture can then be manipulated without pain. One patient with a Pott's fracture, after infiltration, stood on that limb without pain, although the limb bent at the fracture. The ease with which the reduction can be accomplished without muscle spasm is striking. Dollinger would restrict the use of the first method, or injection between the fragments, to those cases in which the circular method of anesthesia is impracticable because of the anatomical situation of the fracture, as in fracture of the clavicle, pelvis, vertebræ, and ribs.

Perirenal Hematoma.—SPEESE (*Surg., Gynec., and Obstet.*, 1913, xvi, 571) says that perirenal hemorrhage is caused by tuberculosis, abscess or tumors of the kidney, necrosis of the adrenal gland, traumatism, and occasionally arises in hemophilia. The spontaneous form is probably due to chronic nephritis, the only pathological lesion which has been demonstrated. The characteristic symptoms of the disease are sudden pain, the signs of internal hemorrhage, and the formation of a retroperitoneal tumor. A moderate degree of hematuria is present in one-third of the cases. Functional tests show diminution in the secretory activity of the kidney. The affection is most commonly mistaken for intestinal obstruction or paranephritic abscess. The disease pursues a rapid course if unrelieved, death resulting from hemorrhage, infection, or pulmonary complications. Medical treatment has been uniformly unsuccessful. Ten of the cases operated on have recovered (62 per cent.). The mortality of the 21 cases treated by both surgical and medical measures is 52.5 per cent.

Arthroplasty.—MURPHY (*Annals of Surgery*, 1913, lvii, 593) says of orthroplasty, which he discusses in an extensive paper, that perfectly movable, normally functionating joints with sliding and rotary motion of the normal type, can be and have been reproduced. A new synovialized membrane is produced with fluid not synovial, but resembling synovial fluid, and lining cells identical with those lining hygroma, and closely resembling the endothelial cells of normal synovial membrane. These joints support full weight and traction. They are painless once the process of repair is complete. They are not subject to the hematogenous metastatic arthritides of normal

joints. A fibrocartilage-like structure develops on the end of the bone, and the latitude of motion increases with time up to the full anatomic limitations in the uncomplicated cases. The production of new joints is not difficult technically, nor is it associated with great danger to life.

THERAPEUTICS

UNDER THE CHARGE OF

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Vaccine Therapy of Carcinoma.—LEWIN (*Therapie d. Gegenwart*, 1913, liv, 253) reports a case of carcinoma of the breast where the subcutaneous injections of the patient's own ascitic fluid had a remarkably good effect upon the patient's condition, so that she was apparently cured, and was in comparatively good health eighteen months after her discharge. This patient had first one breast and then the other amputated for recurring carcinoma and subsequently developed ascites that required repeated tapping. Each time 10 c.c. of the fluid was reinjected subcutaneously before the needle was withdrawn. It seemed that she would have less than a month to live, when first seen, and the marked benefit seemed to be due to the injections. He also reports a second patient who, after removal of one breast for carcinoma, had a recurrence in the other breast. She was given five injections of an autolysate of cancer cells. The recurring nodules gradually disappeared, and the patient, observed now for one year, has been apparently cured. Lewin does not suggest this method as a cure nor indeed as a substitute for surgery, but thinks it may be of great service in inoperable cases, and as an aid to *x*-ray treatment or other measures.

Chronic Arthritis; Therapuetic Evidence of the Incidence of Streptococcal Infection.—JONES (*British Med. Jour.*, 1913, 2733, 1047) says that this paper is a contribution to the bacteriological diagnosis of arthritis based on the results of empirical therapeutic measures. It contains the results of 20 cases suffering from arthritis of various types, in all of which a tentative clinical diagnosis of streptococcal infection was made and which were treated with vaccines of streptococci derived from different sources. They do not go to show that all cases of arthritis are due to streptococcal infection, for the tubercle bacillus, gonococcus, and pneumococcus are all well known to infect joints. If, however, therapeutic results can be accepted as a basis of bacteriological diagnosis, at least eight of these indicate that streptococcal infection is concerned in cases of chronic arthritis. The cases were, in the majority of instances, of long standing, they had resisted general therapeutic measures, and no source of infection

was clearly indicated. Effusion into the joints was rare, and the fluid when removed by puncture was invariably sterile. Blood cultures were also sterile whenever investigated. For various reasons streptococcal infections were suspected and the patients were accordingly treated with vaccines made from streptococci obtained either from the mouth, in cases of oral sepsis, from the urine, or from the feces. Of the 20 cases treated, 1 case was completely cured, 6 were markedly improved; 6 only slightly benefited; 6 not effected, and 1 was made distinctly worse. Jones believes that his therapeutic results justify the conclusion that arthritis may be caused by streptococcal infection chiefly derived from some part of the gastro-intestinal tract.

Benzol in Leukemia.—Rösler (*Wien. klin. Woch.*, 1913, xxvi, 838) reports 2 cases of leukemia, 1 with a leukocyte count of approximately 200,000, and the other with 237,000 leukocytes, successfully treated with benzol. The benzol treatment seemed to cause at first an increase in the leukocytes to nearly 340,000 and 420,000 respectively in the 2 cases. After this preliminary increase in the number of the leukocytes the blood picture began to improve as well as the general condition of the patients. The patients consider themselves cured but the period of observation has been too short to admit of any definite conclusion. The only untoward symptoms observed during the benzol medication were digestive disturbances consisting of oppressive and burning sensations in the stomach and a temporary loss of appetite.

Syphilitic Pernicious Anemia.—Weicksel (*Münch. med. Woch.*, 1913, lx, 1143) reports a case of advanced pernicious anemia in a patient having a positive Wassermann reaction. He found in the literature reports of a number of cases of syphilis with an anemia closely resembling pernicious anemia which improved under antisyphilitic treatment. The patient observed by Weicksel was treated by salvarsan and three months after the first injection the Wassermann reaction became negative. The patient's blood and general condition improved steadily. He believes that this result suggests that salvarsan may be beneficial in the treatment of pernicious anemia. Bramwell has reported a number of cases of pernicious anemia treated with salvarsan with great benefit, and attributes the beneficial effects to the arsenical composition of salvarsan.

The Treatment of Amebic Dysentery by Emetin.—Baermann and Heinemann (*Münch. med. Woch.*, 1913, lx, 1132, 1210) have used emetin in the treatment of 22 cases of amebic dysentery. They consider it a most efficient remedy, although only 6 of the 22 cases were cured. The best results were obtained by injecting intravenously 150 to 200 milligrams in 100 c.c. of salt solution, repeating the injection after eight or ten days. It is also necessary to supplement the intravenous injections by four or five subcutaneous injections of 100 to 150 milligrams at two- or three-day intervals. This after treatment should be repeated at intervals of three or four weeks. Baermann and Heinemann believe that this treatment is more successful in the early cases. A great number of cases relapse and the examination of the stools for amebæ should be kept up for months. This treatment is

based upon rational therapeutics as it has been found that ipecac has a specific action against amebæ. However, ipecac cannot be given in sufficiently large doses on account of untoward by-effects. Emetin is an alkaloid derived from ipecac which Rogers has used with brilliant success in the treatment of amebic dysentery. A dose of emetin containing seventy times the usual dose of ipecac can be given without any untoward by-effects. Baermann and Heinemann state that the maximum intravenous dose of emetin is 250 mg. per 60 kg. of body weight.

Results of Serum Treatment in 1300 Cases of Epidemic Meningitis.—FLEXNER (*Jour. Exp. Med.*, 1913, xvii, 553) gives a final summary of nearly 1300 cases of epidemic meningitis treated by the serum prepared by the Rockefeller Institute. The antimeningitis serum was first employed in 1906, and the latest figures relating to its use included in this report were furnished in 1912. He says that there is no longer doubt that the serum has come to be applied under conditions fairly representing all known manifestations of epidemic meningitis. Hence the test of the serum treatment may be regarded as having been a rigorous one. The mortality of all cases was 30 per cent. The average mortality of the disease not treated by serum is at least 70 per cent. Furthermore, complications and sequellæ are reduced in number. In fact, the number of permanently injured among the serum treated has become very small. Of all the severe sequels, deafness has remained least influenced. Unhappily, injury to the internal ear takes place very early and sometimes before the diagnosis of meningitis has been made. In view of the great reduction in other severe effects, Flexner hopes that even this one may be diminished by a more uniformly early application of the serum. The arthropathies have not only been reduced in frequency, but they have been shown to be amenable to direct injections of the serum. Undoubtedly the tendency to hydrocephalus in the young has been diminished, and the intraventricular injection of the serum has operated in several instances to abolish infection and inflammation of the cerebral ventricles, and to reestablish communication between the ventricles and the subdural space of the spinal cord.

The Prophylaxis and Treatment of Diphtheria.—SCHREIBER (*Deutsch. med. Woch.*, 1913, xxxix, 928) states that his results show that the active immunization suggested by von Behring is entirely harmless and effective as a method of producing protection against diphtheria. He says that the preparation develops an immunity against diphtheria that persists for a much longer period of time than the present method of injecting prophylactic doses of diphtheria antitoxin.

Old and New Salvarsan.—GUTMAN (*Berl. klin. Woch.*, 1913, l, 581), in comparing salvarsan with neosalvarsan, says that the percentage of febrile reactions is somewhat higher after salvarsan than after neosalvarsan, notwithstanding correspondingly larger doses of neosalvarsan were used. Gutman thinks it is probably due to individual susceptibility to salvarsan or to the injection of a hypotonic solution. Gastro-intestinal disturbances were much more marked with salvarsan,

and reactions similar to anaphylaxis occurred after a considerable number of salvarsan injections but not after neosalvarsan injections. No difference or very little in therapeutic effect could be determined.

The Therapeutic Value of Diuretin in Acute Experimental Nephritis.—CHRISTIAN AND O'HARE (*Arch. of Int. Med.*, 1913, xi, 517), in their conclusions, state that diuretin given to rabbits with a severe, fatal, experimental nephritis shortens the duration of life of these animals. On the other hand, 9 out of 12 rabbits which survived the experiment had received diuretin. This work supports the view that in a severe acute nephritis a diuretic drug, such as diuretin is contraindicated, inasmuch as in the experiments diuretin shortened the lives of the animals. On the other hand, of the survivors a large proportion, three-fourths, had received diuretin. This rather gives support to the view that in less severe cases diuretin may be beneficial, and so justifies the cautious use of the drug in moderately severe cases of acute nephritis. In the survivors it is not certain that acute severe renal lesions were produced. Consequently deductions from these relatively few survivors are of less value than from the larger number dying during the experiment. Of course, it is realized in making deductions such as the above, that they may not be applicable directly to conditions in the human being, for due allowance must be made for the many differences between man and the lower animals. The experiments, however, certainly support the view that diuretin as a diuretic drug may be harmful in a case of acute nephritis.

The Treatment of Malignant Pemphigus by Intravenous Injection of Human Blood.—PRAETORIUS (*Münch. med. Woch.*, 1913, lx, 867) reports that a woman, suffering for two years from a severe pemphigus which had resisted all therapeutic measures, was completely cured by one intravenous injection of 20 c.c. of fresh human blood. The blood was obtained from the donor by syringe, and immediately injected into the patient's vein. No by-effects were observed, and by the third day distinct improvement was noted, and at the end of a week the recovery was complete. The cure has now lasted for a period of eight months, with absolutely no sign of recurrence. Praetorius believes that there is no danger in the use of non-defibrinated blood if the blood is obtained rapidly and fairly fine needles are used, so that the passage of large coagulæ are prevented.

OBSTETRICS

UNDER THE CHARGE OF

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Pregnancy Complicated by Abnormal Conditions in the Pelvic Viscera.—WALLART (*Monats. f. Geburt. u. Gynäk.*, 1912, xxxvi, No. 5) has studied the changes produced in the Fallopian tubes by

pregnancy, and illustrates his article by microscopic pictures. He believes that the changes in the tubes are practically those which go on throughout the uterus. As the fundus rises, the tubes become longer and considerably stretched. Those who have studied the subject believe that the increase in size in the tube during pregnancy may be referred to the growth of the unstriped muscle fiber. If a tube be cut in a cross-section, the dilatation and engorgement of the vessels attract attention upon microscopic examination. During operations upon the tube in pregnancy, one often sees apoplexies in the connective tissue of the tube, which confirms the microscopic appearance. The connective tissue and fibrous tissue is enlarged, and the cellular elements are increased. Leukocytes are abundant as well in the vessels as in the connective tissue. Their number may be so great as to resemble abscess formation. In examining a Fallopian tube removed during the last month of pregnancy, the abundance of round-cells was very noticeable, and the nuclei stained dark, with little protoplasm. Among them were many long, clear nuclei, with abundant processes. Masses of protoplasm were found with varying nuclei, and abundant migratory cells. Syncytial changes seem to have occurred in the endothelium. The formation of decidua was plainly demonstrated, not only by the presence of decidual cells, but by the formation and arrangement of the cells. Villi were present, and syncytial cells also. In ectopic gestation there seems to be little difference in the decidual reaction and formation in the tube. In the uterus in ectopic pregnancy, the uterine decidua seems much more abundant than that in the tube.

ANDREWS (*Jour. Obstet. and Gyn. of British Empire*, October, 1912) reports the case of a multipara who, on rising from the floor, had a sharp pain in the right side of the abdomen. There was no vomiting, and the pain was made worse by the motions of the child. The pulse and temperature were normal, there was a tense spot just above and internal to the right anterior spine, without rigidity. There was no evidence of involvement of the right kidney, and vaginal examination was negative. A diagnosis at the time was impossible, and the patient was ordered to remain in bed, to have the bowels moved, and to use counter-irritation. Three days afterward the abdomen became greatly distended, the pain was severe, peristalsis was visible, and the patient was vomiting. Upon section, a small, purple body was seen in the right iliac fossa attached to the fimbriated extremity of the right Fallopian tube. It seemed to be a soft structure which had become solid as the result of thrombosis. The tube, ovary, and appendix, were normal. The small purple body was removed after ligating its attachment to the fimbriated extremity of the tube. There was no abnormality about the abdominal contents, but the abdominal wall was very thin. The patient suffered greatly after operation from distention of gas, but gradually recovered. Microscopic examination showed the tumor to be a thin-walled cyst filled with blood-clot. It was apparently a twisted hydatid of Morgagni, which must have been about the size of a small grape before torsion occurred.

GRADL (*Zentralbl. f. Gynäk.*, 1912, No. 17) reports the case of a multipara with double gonorrheal pyosalpinx. The uterus was edematous and somewhat swollen. The tumors were so adherent that it

was thought unwise to remove them, and it was hoped that spontaneous evacuation of pus through the rectum would occur. This subsequently happened, the tumors disappeared by vaginal examination, and the patient was discharged from the hospital. She afterward returned pregnant, complaining of pain in the abdomen and an abundant discharge of pus through the rectum. The pain became so great that the patient demanded that abortion be produced. This was declined, and the patient went to term, giving spontaneous birth, in normal labor, to a living, normal child. The child had no ophthalmia and seemed vigorous. The case is interesting because of the double pyosalpinx, and the discharge of pus through the rectum for more than half of the pregnancy. In spite of this, mother and child escaped infection during labor and in the puerperal period.

FRIES (*Zentralbl. f. Gynäk.*, 1912, No. 37) reports the case of a primipara about four months pregnant, who suffered from frequent vomiting and severe pain in the right side of the abdomen. Examination revealed a tumor which seemed to be an ovarian growth. At operation, the tumor was found in the right broad ligament, extending to the fundus. This proved to be an echinococcus cyst complicated by the presence of an intraligamentary myoma on each side. The patient recovered without the interruption of pregnancy. Labor came on at term and was long and tedious, but was finally terminated with delivery by forceps. The child was unusually large and was born asphyxiated, but recovered. Mother and child made a good recovery.

Chorionic Villi in the Uterine Wall Eighteen Years after the Last Pregnancy.—RIES (*Amer. Jour. Obstet.*, March, 1913) reports a very suggestive case which has to do with the question of development of chorio-epithelioma malignum. His patient was a negress who sought hospital treatment for uterine hemorrhage. Her history stated that menstruation had always been profuse, she had married at eighteen years, and had four full-term labors with normal pregnancies and natural delivery. There was no excessive hemorrhage or infection, and she had nursed each child about four months. She had had four abortions from unknown causes. There had been no complications with these abortions. Recently, menstruation had been prolonged and unusually frequent, causing profound anemia. Upon examination, she had a mass of fibroids in the uterus. At operation, the body of the uterus with the fibroid mass and the appendix were removed. The patient's recovery was uninterrupted and complete. Upon examining the specimen, the uterine cavity was smooth and lined with a thin mucous membrane. A peculiar white, translucent, thread-like formation protruded from the cut surface of the uterus where it it had been separated from the cervix. Upon dissection, it was found to be contained in a large vein. By splitting up the vein and following upward, this thread-like mass reached the left uterine cornu, where it was attached to the wall of the vein. The thickness of the uterine wall was about 3 cm. The thread-like mass was solid, and its lower end slightly clubbed. Upon cross-section through the uterine cornu, one vein was filled with these whitish formations resembling grapes, and this mass could be withdrawn from the vein. Others showed a similar appearance. Upon examining the tissue microscopically,

these masses were found to consist of chorionic villi which had undergone fibrinous and hyaline degeneration. At several points the villi invaded the substance of the uterus. This case explains some late appearances of chorio-epithelioma malignum at long and irregular intervals, after a partial or complete abortion.

The Difficulty of Producing Sterility by Operations on the Fallopian Tubes.—LEONARD (*Amer. Jour. Obstet.*, March, 1913) reports from the Johns Hopkins clinic two cases where the attempt had been made to produce sterility by ligating the Fallopian tubes with silk. In both cases the attempt was unsuccessful, the patient afterward conceiving. Reference to the literature shows that section and resection of the tubes between two ligatures is also unreliable, and that resection of the tubes between two ligatures with burial of the uterine end may be followed by conception. The cautery is no more successful, and even bilateral salpingectomy has failed. The attempt has been made to produce sterility by resecting interstitial portions of the tube by the removal of a wedge-shaped piece from the uterine cornu. While this is in many cases successful, it has not been so in all. Experiments upon animals have led to no definite conclusion, except that it is probably necessary to insure sterility by removing the entire Fallopian tube, together with the interstitial portion of the uterine cornu.

The Effect upon Pregnancy and Labor of Ventro-enucleation of Intramural Fibroids.—ENGSTROM (*Monats. f. Geburts. u. Gynäk.*, 1912, xxxvi, Festnumer) has studied the results of ventro-enucleation of intramural fibroids in 27 patients in whom conception afterward occurred. The size of these tumors had varied from 5 as large as a child's head to those as large as an egg. In 3 cases, the tumors were in groups in different portions of the uterus. One patient conceived soon after operation, 7 within six months, 5 within a year, 9 between one and two years, 3 between two and three years, and 3 after three years. In 20, pregnancy proceeded normally; 12 patients had borne each one child, and 1 patient six children; in 20 of them 1 patient had abortion; 2 premature birth; in 1 case the fetal heart sounds ceased four weeks before birth; and in 2 cases there was twin pregnancy, the children dying soon after labor. In all, there were 7 cases in which the one pregnancy, which occurred after operation, terminated in abortion. So far as could be traced, this result could not be ascribed to operation, and these patients were treated outside the clinic by physicians unknown to the hospital. The most probable reason for the abortions was thought to be some chronic inflammation of the endometrium. Among these 27 patients were born 38 fully developed children, and, in 3, premature children, without apparent injury to the uterus. There was but 1 artificial labor terminated by the high application of forceps. In but 1 case was the puerperal period complicated, and that by prolonged hemorrhage.

Ectopic Pregnancy.—LUCY (*Jour. of Obstet. and Gyn. of British Empire*, March, 1912) reports a case of combined pregnancy in which the patient, after severe abdominal pain, collapsed, and later expelled from the uterus a four-months' fetus without the placenta. This was followed by abdominal distention and fever, great pain and shock,

and swelling of the right iliac fossa. Upon section, the right tube had ruptured and had contained a four-months' fetus which was lying among the intestine. Upon opening the uterus, the placenta and the first fetus was found firmly attached. The corpus luteum of the right ovary was of more recent date than those of the left.

A case of ovarian pregnancy, illustrated by a very clear drawing, is reported by BANKS (*Jour. Obstet. and Gyn. of British Empire*, April, 1912). The case was typical of ectopic gestation, and this diagnosis was made upon examination. At section, a tumor upon the right side consisted entirely of ovary, the normal tube being free. A small portion of ovarian tissue was left, and the cut edges closed with catgut. The patient made an uninterrupted recovery. Upon microscopic examination, the pregnancy was clearly ovarian, and the growth of the villi had been similar to that observed in tubal gestation.

Primary abdominal pregnancy is reported by RICHTER (*Archiv f. Gynäk.*, 1912, xcvi, No. 3). The patient was admitted to hospital following severe pain in the lower abdomen, with collapse. Upon examination there was dulness above the symphysis, and abdominal tenderness. Upon vaginal examination, the uterus was small, anteflexed, and there was no tumor of the Fallopian tube. An indefinitely outlined mass could be made out behind the uterus. A diagnosis of probable tubal abortion was made, and operation was performed. Upon section, intra-abdominal bleeding was present, which could not be traced to the tube or ovary. The ovum was found implanted upon the rectum, both Fallopian tubes being normal. The ovum was removed and the tissues closed by suture. On examination, the villi of the chorion had penetrated the wall of the intestine for a considerable extent, and there was every evidence that pregnancy had been primary and abdominal. The patient's recovery was uninterrupted.

JELLINGHAUS (*Amer. Jour. Obstet.*, April, 1912) describes an interesting case of true ligamentous unruptured tubal pregnancy of eight months. The patient had been treated in the hospital for pelvic exudate without relief. When seen, the tumor was the size of an eight-months' intra-uterine pregnancy, and there was no sign of fetal life. Examination under anesthesia showed that an unruptured tubal pregnancy of about eight months was present. The fruit sac, with the placenta and membranes, were removed by section. The patient's recovery was complicated by vaginal and abdominal fistulæ and urinary fistula, probably caused by pressure of gauze packing. This gradually closed.

Interstitial pregnancy is reported by MARKOE (*Amer. Jour. Obstet.*, April, 1912) in a patient who, five years previously, had been admitted to hospital with what was believed to be incomplete abortion. Curetting failed to discover the fetus. The patient left the hospital against the advice of the physician, but returned in collapse with rapid pulse and high fever. After several months she was sufficiently recovered to leave the hospital. When she returned five years later she stated that she had been delivered three years previously, with instruments, of a large stillborn child. Vaginal examination showed a tumor on the right side of the uterus, very tender, and slightly movable. Upon section, the tumor was directly connected with the right cornu of the uterus. Upon examining the specimen, interstitial pregnancy was found to be present.

GYNECOLOGY

UNDER THE CHARGE OF

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Dangers of the Trendelenburg Posture.—The opinion that more fatalities during anesthesia result from an increased flow of blood to the heart than from the opposite condition, a diminished supply resulting from hemorrhage or so-called surgical shock, is expressed by GATCH and his associates (*Jour. Amer. Med. Assoc.*, 1913, lx, 1273). From both clinical observations and animal experiments, they have come to the conclusion that a very severe, and at times fatal, strain can thus be thrown on the right heart when a condition of asphyxia exists in conjunction with the Trendelenburg position. The entire vasomotor mechanism, wherewith the body normally compensates for the effects of gravity on the circulation, being deranged under these circumstances, the blood pressure is raised, and at the same time the head-down posture causes every drop of blood passing through the capillaries of the abdomen and legs to return quickly to the heart—a condition which is not present when asphyxia occurs with the body in the horizontal or upright position. This return of blood to the heart may be so excessive as to subject that organ to an undue strain, and if the patient struggles, or pressure is made on the intestines—as by extensive packing-off—the state of affairs is rendered much worse. In the absence of asphyxia, however, it is doubtful if these agencies can injure a normal heart. The authors believe, as a result of their studies, that patients with well-marked cardiac disease either should not be placed in the Trendelenburg posture at all, or that this should be used with the most extreme caution, the horizontal position of the body being changed to the head-down one very gradually, so as to prevent a too sudden inflow of blood to the heart, and in all cases, they consider it of great importance to conduct the entire anesthesia without permitting the patient to become cyanotic at any time, making use of a preliminary injection of morphine if necessary to secure this result.

Effect of X-ray Treatment of the Ovaries upon Exophthalmic Goitre.—An interesting clinical contribution to the much-discussed question of the relationship between the thyroid and the female genital glands is furnished by the report of MAMMABERG (*Wien. klin. Woch.*, 1913, xxvi, 693) who has subjected 10 women suffering with the classical symptoms of Basedow's disease to Röntgenization of the ovaries. They were all treated as ambulatory patients, their manner of living being in no wise altered, so that the results observed must be considered due to the treatment itself, and not to any extraneous factors, such as rest, improved care, or diet. The number of exposures given varied from 3 to 15. In 8 of the 10 patients a marked increase in

body-weight occurred, amounting in one instance to 21 per cent. of the patient's previous weight, and averaging about 11 per cent. of this. In half the cases the exophthalmos was unaffected, but in the other half it was distinctly reduced, in one instance disappearing completely. Practically no effect was produced upon the size of the goitre, some of the patients showing a slight increase in this, others a slight decrease. The most marked improvement noted, however, was in the subjective condition of the patients; with only one exception (a woman treated but a very short time) all the distressing symptoms of the disease disappeared, the patients felt entirely well, and were able to return to their regular work, which in several instances they had been forced to abandon. A troublesome diarrhea which was present in several disappeared after a few treatments. Mammaberg says that he has now been experimenting with this form of treatment for about a year and a half, and although as yet he cannot speak of any case as being completely and permanently cured, he thinks the results so far attained justify more extensive investigations along this line. He considers the apparent benefits which follow the treatment to be due to some quantitative or qualitative alteration produced by the *x*-rays upon the internal secretion of the ovaries, this probably consisting in the suppression or reduction of some substance formed in them which has an action upon the thyroid, stimulating it to the production of substances which cause the symptom complex of Basedow's disease. Direct radiation of the thyroid itself, on the other hand, is apparently without effect, two patients in whom this was tried following the ovarian treatment showing a distinct retrogression, and a third remaining entirely unaffected.

Thyreogenic Origin of Uterine Hemorrhage.—Another paper dealing with the relations of the thyroid to the female generative system has recently been published by SEHRT (*Münch. med. Woch.*, 1913, lx, 962). He reports that in 13 out of 20 patients suffering from uncomplicated "metropathic" hemorrhages, without demonstrable anatomic basis, all the distinctive blood-changes were found which have been described by Kocher as characteristic of hypofunction of the thyroid gland—a relative neutrophilic leukopenia, with corresponding lymphocytosis, a total leukocyte count below 6000, and a marked reduction in the coagulation-time of the blood. In 6 of the remaining 7 cases the coagulation-time was decreased, but either the neutrophilic leukopenia or the lymphocytosis was lacking. Sehrt expresses the belief that disturbances of the normal relations between the thyroid and the ovaries may perhaps be the cause of these hemorrhages, which have as yet remained unexplained on anatomic grounds, many cases of so-called "metropathia hemorrhagica" representing, in fact, abortive cases of myxedema, and, further, that insufficient activity on the part of the thyroid gland may have some causal relation to the production of eclampsia.

Diagnosis of Renal Tuberculosis.—In discussing the very important question of the determination of the presence or absence of tuberculosis in an apparently healthy kidney in the presence of known infection of the other, CASPAR (*Deutsch. med. Woch.*, 1913, xxxix, 1140) says

that he believed that any urine, no matter how nearly normal chemically and microscopically, which caused tuberculosis in injected guinea-pigs, indicated a positive tuberculous infection of the kidney from which it was obtained. Later researches by himself and others have shown, however, that this is not always the case. He has found that while an entirely *healthy* kidney never secretes urine containing tubercle bacilli, a *nephritic* organ (not tuberculous) may transmit and excrete tubercle bacilli which are circulating in the blood, without itself containing any tuberculous focus. If the urine, obtained by ureteral catheterization, contains at severeal examinations albumin and tubercle bacilli—perhaps, though not necessarily, casts also—it is safe, in Caspar's opinion, to assume that the kidney itself is not tuberculous. If, however, leukocytes and red blood cells are present in addition, the question becomes more complicated, as these may indicate the presence of a destructive tuberculous process in the kidney. They may also be present, however, merely as a result of the nephritis, without any such destructive process. In such cases, Caspar bases his differential diagnosis on the fact that in a moderate degree of toxic nephritis—which alone could come into consideration—leukocytes and red blood cells are present in the urine only in very limited quantities, and as a rule not constantly; albumin and casts are present, moreover, in amounts greater than can be accounted for by the corpuscular content, while the kidney function as estimated by the various functional tests—is well preserved. In the case of true renal tuberculosis, however, the urine is much richer in leukocytes and red blood cells; casts are very scanty, or entirely absent, and the functional activity is markedly reduced.

Histology of the Corpus Luteum.—A few points of interest are brought out in a recent paper by MILLER (*Berl. klin. Woch.*, 1913, i, 865) with regard to the histogenesis of the corpus luteum, and the differential diagnosis between the corpus luteum of menstruation and that of true pregnancy. Miller says that he has found in the cells of numerous corpora lutea of pregnancy small droplets of colloid material, a substance which, in his opinion, can arise only as a result of degeneration of *epithelial* tissue, this finding furnishing, therefore, further evidence in favor of the now pretty generally, though not universally, accepted theory of the epithelial origin of the corpus luteum, as opposed to that of its stromatogenic origin. Miller has never found this colloid material in corpora lutea menstruationis; these undergo a fatty degeneration, small droplets of neutral fat, demonstrable by Sudan III, appearing as soon as retrogression begins. Moreover, small foci of calcification are qiute common in corpora lutea of pregnancy, but are very rarely found in those of menstruation, and are therefore also of value from a diagnostic standpoint. That this question is not a purely academic one is illustrated by a case which Miller quotes. A patient, aged fifty years, in whom the possibility of pregnancy had not been thought of, was operated upon for cystocele by the Schauta-Wertheim method (interposition of the uterus between the vagina and bladder), at the same time, one tube and ovary being removed for some reason, and sent to the laboratory. Upon receiving the pathologist's report that the latter organ contained

a large, fresh corpus luteum, the surgeon remembered that the uterus at operation had appeared rather large, soft, and hyperemic, and was greatly worried lest he had performed the interposition operation upon a pregnant uterus, a procedure which would surely lead to serious results unless early abortion should occur. A more careful examination of the corpus luteum, however, demonstrated the presence of numerous fat droplets, without colloid or calcification, upon which the definite diagnosis of a corpus luteum menstruationis was made, a diagnosis which the subsequent course of the case showed to be correct.

OTOLOGY

UNDER THE CHARGE OF

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Prognosis in Gunshot Wounds of the Ear and Report of a Case of Operative Removal of a Revolver Bullet from the Middle Ear with Preservation of the Hearing.—Notwithstanding the frequency of gunshot wounds of the temporal bone, since this is an accepted region for attack in attempts at suicide by means of fire-arms, the infrequency of reports of successful attempts at the removal of the incident projectile is due, according to LEWIN (*Monatsch. f. Ohrenheilk.*, xlvii, 6), to the fact, on the one hand, that the patient declines operation, or on the other, that the surgeon, in default of immediate danger to life, hesitates to undertake a difficult and critical operation. Before the contribution of Schwartze, in 1885, the opinion of Bergmann that a gunshot wound of the temporal bone was almost invariably fatal, because his careful search of the literature of the subject revealed only two exceptional cases, was that usually accepted, but Schwartze, five years after Bergmann's report, published a series of such exceptional cases and was followed with numerous similar contributions by other authors. Schwartze explained the exceptional cases upon the basis of the fact that the frequent backward pointing of the weapon resulted in the expenditure of the major force of the projectile upon the resistant posterior wall of the bony external canal and the mastoid process, rather than forward and inward toward the carotid artery and inward toward the sinus. Notwithstanding this preservative factor a fatal termination is by far the more common result of a rifle or a revolver wound in the area in question, and this liability is enhanced by the increased penetrative power of modern projectiles. In the majority of the fatal cases death is practically immediate though Preysing and Schwartze report a case in which the ultimate result followed the injury three and one-half years later in consequence of leptomeningtis, a circumstance in favor of Lewin's concluding argument that when the presence of a projectile in the middle ear is satisfactorily determined, the prognosis as to the ultimate result

must be a doubtful one until the foreign body has been removed. With the successful removal of the projectile the prognosis is improved and steps toward repair of the injury, and of the effect of the possible localized suppurative process, may be undertaken; in view of these considerations the fact of the presence of the projectile in the middle ear is sufficient ground for operative interference. Lewin's case was that of a man, aged twenty-six years, who reported that he had been wounded, in the left temporal region, two and one-half years previously, two balls from a bull-dog revolver having taken effect one in front of and the other behind, the left ear; he immediately lost consciousness and recovered to find himself in a military hospital where he remained two months and was then discharged well and returned to duty. During the two following years he was in good condition, except for impaired hearing and subjective noises in the left ear but at the end of that time there began, without untoward symptoms, a thin discharge from the left ear which soon became purulent and offensive, and had so continued up to the time of his examination, recently also there had been a swelling below the auricle and pain in the depth of the ear. The first ball had entered the ear in the region of the tragus and the second had taken lodgement in the soft cervical tissues, as shown by a scar $2\frac{1}{2}$ cm. below the auricle. The presence of the first ball in the depth of the middle ear was determined by objective and tactile examination and by means of radiography and confirmed by the radical operation that followed. This operation included an extensive removal of the surrounding bone, much of which had been splintered, in order to get adequate room for the removal of the projectile, the expansion of which had forced it upward to the tegmen tympani, backward to the mastoid antrum and the region of the horizontal semicircular canal and against the wall of the nerviduct of the facial, and likewise forward to the wall of the carotid canal; the drum-head and ossicles were absent. The subsequent progress of the cases was uneventful, at the end of two months dermatization of the cavity had been effected, there were no subjective symptoms, beyond a moderate circulatory tinnitus, and the hearing was improving, the voice in ordinary conversation tone being heard, in the left ear, at a distance of five meters.

A Fourth Crista Acustica.—Benjamin (*Zeitsch. f. Ohrenheilk.*, Band lxviii, Heft 2–3, S. 101) describes the structural differences between the crista and the macula acustica and summarizes them, the crista being elevated, resting upon a fold of the membranous wall having long ciliate projections and lacking oboliths, the macula, on the contrary, presenting a flattened or depressed surface, the ciliate projections being short and the surface beset with oboliths, and follows with a careful review of the literature of the subject together with the result of his own observations, and a comprehensive summary. In the majority of vertebrates there is, in addition to the crista of each of the three ampullæ a fourth crista situated in the posterior sinus of the utricle in the neighborhood of the ampulla of the posterior, vertical canal. This Benjamin considers to be the so-called macula acustica of Retzius or macula acustica neglecta not at all a macula in the sense of the differentiation made by the author but veritably a

crista, occurring in the majority of the vertebrates, in the lower forms as a well developed fourth crista, in the higher as a more or less rudimentary organ. URBAN PRITCHARD, at the meeting of the Ninth International Otological Congress, demonstrated recently discovered extra nerve terminations in the ampulla in birds, their being, in some birds, in addition to the nerve epithelium of the crista acustica of the ampulla, large areas of similar nerve terminations lining the walls of the ampulla and the surfaces of the fan-shaped bodies described by Albert Gray. In a similar communication, at the meeting of the Seventeenth International Congress of Medicine, he refers to the work of McKenzie on the semicircular canals and sense of position or orientation and considers the importance of an extra acute orientation to birds for flying, especially to the migratory birds, as met by the larger areas of nerve terminations in the semicircular canals.

Improvement in Hearing after the Radical Operation by Use of an Artificial Drum-head.—In 49 cases with absence of the drum-head and dermatized surfaces throughout the middle ear, the majority of them successfully healed radical operations, GUTTICH (*Passow's Beitrage*, vi, 3) endeavored to improve the hearing by means of the application of cotton artificial drum-heads soaked in paraffin inserted in the customary manner and allowed to remain at first from fifteen to thirty minutes, then gradually, for longer periods, up to eight or ten hours and in some instances continually for several days. The lesser resistance of an artificially dermatized surface to the influences of irritation and maceration demands more careful observation of conditions than would be needed in cases where the artificial drum-head rests upon a secreting mucous membrane. In 35 of the 49 patients tested by this application the hearing was not improved, or in so slight a degree as to make the gain practically valueless. In the remaining 14 cases there was marked improvement, in different degrees, but always accompanied by an extension of the lower tone limit and often a lengthened duration of hearing for the lowest tones; the especial value of the application in these cases being that the patients heard surrounding conversation not only from a greater distance, but more easily and better defined.

Primary Acute Mastoiditis.—DE SANTALO (*Archiv. International*, 1913, xxxv, 1). In a patient presenting the symptoms of an acute mastoiditis of six days' duration, fever, pain, tenderness upon deep pressure over the mastoid, edema and projection of the auricle, the external canal was filled with a mass of cerumen, the removal of which revealed a drum-head entirely normal in appearance, with exception of a moderate injection of the pars flaccida and of the manubrial plexus. An extensive incision of the drum-head was ineffectual so far as the liberation of contained discharge was concerned, the ear remaining dry, operative opening of the mastoid cavity was proposed for the following day. In the meantime an effort was made, by means of repeated warm instillations of cocaine and adrenalin solutions and cataplasius, to effect a decrease in the swelling of the mucous membrane of the aditus and outflow of the fluid, retained within the mastoid, through the antrum. During the night there

was an improvement in the symptoms and in the morning a copious purulent discharge from the ear containing Staphylococcus aureus occurred; five days later the ear was entirely healed. The infrequency of duly accredited cases of suppuration in the mastoid cavity without a corresponding suppuration in the middle ear makes this report of especial value, the infection having occured, in de Santalo's opinion, from a diseased condition of the nose, through the tube and the tympanum, without infection until the antral mucosa was reached, when the incident swelling closed off the pneumatic spaces of the mastoid and permitted proliferation of the infection within that area only.

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF

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Air Emboli in the General Circulation.—BENEKE (*Centralbl. f. allgem. Path. u. Path. Anat.*, 1913, xxiv, No. 9) gave at the recent meeting of the German Pathological Association, a paper upon the occurrence of air emboli in the general circulation, apart from its existence in Caisson disease. It occurs, of course, relatively seldom, but may happen by the entering of air into the lungs through wounds of those organs. Many authors have considered the possibility of air making its way through the intact lung capillaries into the pulmonary veins in so great a quantity that sudden death has occurred by reason of its lodging in the arteries of the brain; it is necessary for such a happening that the intrapulmonary pressure should be extremely high. When such diffusion of air does occur, it is most often combined with interstitial emphysema, so that it is perhaps incorrect to speak of intact lung capillaries, although capillary hemorrhages in some of the experiments have not been seen. Beneke observed 4 cases of "foam" found in the heart and vessels, especially in the left auricle and left ventricle; 2 of these had occurred in newborn children with asphyxia at birth; in 2 other cases, there had been spasmodic deep breathing after a hemorrhage under the tentorium; 2 other cases referred to three months' old children with hemorrhage, in both of whom death had occurred suddenly, one with air embolism in the left auricle of the pulmonary artery, and the other with air embolism in the right heart, which apparently occurred by the passage of air from the general circulation. The existence of such cases as those in which there are emboli in some of the brain vessels demands that the section be made with the entire body under water. The suggestion is offered that some of the brain necroses of obscure origin arising in children during the first week of their age, showing themselves as large ischemic softenings or multiple small areas of calcification in the

brain following upon primary necrosis, may have originated through air emboli. The rapid absorption of air in such a locality would naturally occur, so that the exact diagnosis must remain doubtful. Beneke considers that from what is known about Caisson disease, it must not be considered that air emboli necessarily lead to rapid death; but that there may be definite local lesions occurring as a result, which become healed.

Formation of Bile Pigment from Hemoglobin.—WHIPPLE and HOOPER (*Jour. Exp. Med.*, 1913, xvii, No. 6) find as a result of their observations upon dogs, that hemoglobin can be changed into bile pigment in the circulating blood without the participation of the liver; in which case they think it likely that the endothelium of the bloodvessels is the agent. They injected, intravenously, red cells obtained from the animal injected and laked by distilled water. The change to bile pigment occurs in the same time in animals with normal circulation, in Eck fistula animals, and in animals with Eck fistula plus ligation of the hepatic artery. Even when the liver, spleen, and intestines have been shut out of the circulation, and in animals with head and thoracic circulation, bile pigment formation goes on as above. When normal and Eck fistula dogs are injected with hemoglobin from the animal's own laked red cells, hemoglobin appears in the urine in a few minutes, and bile pigment in from one to one and a half hours. If the portal blood be shut out from the liver, or if the liver blood supply be lessened by three-fourths, the reaction is unmodified. Hematogenous jaundice produced by chloroform anesthetic with a central liver necrosis occurs alike in the normal and the Eck fistula animal, and is considered by the authors to be partly due to capillary biliary obstruction, and partly to the formation of a hemlysin in the injured cells of the liver. Bile and bile pigment are formed less abundantly in an Eck fistula dog than in a normal animal, with less icterus, which is probably to be explained by the lessened activity of liver cells under a decreased blood supply. Bile pigment can scarcely, therefore, be formed solely from hemoglobin, because hemolysis is not more abundant in the normal than in the Eck fistula dog. Whipple and Hopper consider, therefore, that bile pigment formation depends rather upon the activity of the liver cells than upon the amount of hemoglobin supplied to them.

Diabetes Insipidus and Tumor of the Hypophysis.—BERBLINGER and GOLDZIEHER (*Centralbl. f. allgem. Path. u. path. Anat.*, 1913, xxiv, No. 9) have brought forward reports indicating the liability of tumors of the hypophysis to cause diabetes insipidus. The former reported a primary sarcoma which had grown extensively in the brain and had involved the stalk and the posterior lobe of the hypophysis; diabetes insipidus had arisen about six months before death. Goldzieher's first case had polyuria for six years, and at section there was found a dense fibrous semicircular tumor in the sella turcica, in which the chiasm was embedded. It consisted of fibrous tissue with granulation cells which by the inroad of lipoid had become xanthoma cells; the posterior lobe as well as the infundibulum was completely implicated; the anterior lobe, with the colloid

retained in the intermediate zone, remained unchanged. His second case, again one of true diabetes insipidus, died by reason of a carcinoma of the lung. The hypophysis though unchanged to the naked eye, showed microscopically a cystic adenoma of the intermediate zone, and serial sections showed that there was a definite pressure upon the intermediate lobe. When one considers with such case reports of diabetes insipidus, the existence of changes that have been observed in the adrenals, and the various forms of dystrophy which have been frequently described, it is realized that we are probably dealing with a disease of very complex etiology concerned with the functions of the ductless glands.

Experiments with Blood Serum and Cerebrospinal Fluid of Epileptics.—Trevisanello (*Centralbl. f. Bakt. Parasitenk. u. Infektionskr.*, May 23, 1913, Band lxix, Heft 3) undertook the injection of blood serum and cerebrospinal fluid from epileptics under the dura of guinea-pigs. His results showed that in a series of experiments, if the blood serum of an epileptic was injected into a guinea-pig, and after eight, ten, or twelve days the cerebrospinal fluid of the same patient was similarly injected, anaphylactic phenomena resulted, consisting of convulsions, subnormal temperature, and sometimes death. It mattered not whether the cerebrospinal fluid or the blood serum was injected first. He found that the anaphylactic reactions appeared more quickly, and were more pronounced if the patients from which the fluids were taken, were the subjects of frequent and lasting epileptic crises, than if they were less so. The same result was obtained whether the fluids were taken immediately after an epileptic attack, or after the lapse of time. Trevisanello's experiments were properly controlled. The blood serum of epileptics followed by cerebrospinal fluid gave the results above noted, and in the fatal cases no pathological changes were found at autopsy. The symptoms came on within a few minutes after the second injection had been given, and lasted sometimes as long as an hour. None of the experiments so conducted failed to show this result. In the groups of animals, however, in which epileptic serum was followed by non-epileptic cerebrospinal fluid, or non-epileptic cerebrospinal fluid followed by epileptic serum, there were no results. In the groups of animals where non-epileptic serum and non-epileptic cerebrospinal fluid were used under the same circumstances, no effects upon the animals were observed.

Typhoid and Antityphoid Serum.—Andriescu and Ciuca (*Annal. de l'Inst. Pasteur*, Tome xxvii, No. 2) have been able to test Besredka's serum by giving it in large doses to 17 severe cases of typhoid fever, in which the diagnosis has been established by the serum reaction and the finding of bacilli in the blood. The serum was given hypodermically, and sometimes in very grave cases by the veins; once it was administered by the mouth throughout five sucessive days. As soon as the sick became convalescent, Andriescu and Ciuca made repeated bacteriological examination of the stools for the purpose of determining if bacilli were or were not being secreted by this road. The bacilli disappeared from the circulation very quickly after the injection of serum, and they have not been able to get a single instance

of blood culture in any case after it had been administered. The disappearance of the bacilli from the stools is also prompt and complete. They have not found any direct result upon the course of the fever, but consider there is a marked amelioration of the health. Among 17 cases so treated, all severe examples of the disease, only 1 has proved fatal. Bacteriolysis may be so rapid, and so slight a quantity of endotoxin may be thrown out that there may be an eruption of sterile scattered abscesses. Andriescu and Ciuca are unable to say whether the source is anti-endotoxic, or is merely bacteriolytic, nor have Pfeiffer and Bessau been able to discover the answer to this question.

Streptococcus in Rheumatism.—Beattie and Yates (*Proc. Path. Soc. Great Britain and Ireland*, January 3–4, 1913) examined 129 cases of various infective maladies, taking their cultures most frequently from the synovial membranes. Forty-eight of these yielded the streptococcus, and of these 48, 32 had a history of recent rheumatism. From these 32 cases of recent rheumatism, 31 inoculations were made into rabbits, yielding in 1 case septicemia, and in 19 cases arthritis; 11 cases showed no result; of 8 samples of streptococci from non-rheumatic cases, 7 times septicemia occurred, and once arthritis. In 12 human cases that they examined during the active process of rheumatic fever they obtained three positive results, of which each strain produced arthritis in the rabbits experimented upon.

The Cultural Reactions of the Typhoid-coli Group.—Emrys-Roberts (*Proc. Path. Soc. Great Britain and Ireland*, January, 1913), experimenting on certain well-known tests used to differentiate bacillus typhosus and Bacillus coli, considers that 10 per cent. peptone water is superior to 1 per cent. for the indol reaction; that the chloroform indol reaction will not differentiate strains of B. coli; that boiling after the addition of the reagents in the indol test intensifies the reaction; and that the neutral red reaction is unsatisfactory. Ten per cent. lactose added to litmus milk hastened the acid and clot reaction for B. coli, and for organisms producing a permanent alkalinity, after a transient acidity, the ordinary litmus milk is preferable. Emyrs-Roberts also considers that 15 per cent. lactose litmus broth is extremely valuable, in differentiating closely allied organisms of the colon group one from another.

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